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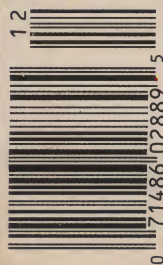
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For business users who need a 386 system, this is the best combination of performance and value available. Running at 20 MHz, this 32-bit system is faster than the IBM PS/2 Model 80 and the Compaq 386/20. With its high performance disk drives and Intel Advanced 82385 Cache Memory Controller, it brings a new level of performance to complex spreadsheets and databases. As you might expect, it runs windowed software at extremely high speed. It's also well-suited for desktop publishing applications, or as a network file server.

#### STANDARD FEATURES:

- Intel 80386 microprocessor running at 20 MHz.
- 1 MB of RAM\* expandable to 16 MB† using a dedicated high speed 32-bit memory slot.
- Advanced Intel 82385 Cache Memory Controller with 32 KB of high speed static RAM cache.
- Page mode interleaved memory architecture.
- Socket for 20 MHz Intel 80387 or 20 MHz WEITEK 3167 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Dual diskette and hard disk drive controller.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 8 industry standard expansion slots.

#### OPTIONS:

- 20 MHz Intel 80387 math coprocessor.
- 20 MHz WEITEK 3167 math coprocessor.
- 1 MB or 8 MB† memory upgrade kit.
- 2 MB or 8 MB† memory expansion board kit.

**\*\*Lease for as low as \$148/Month.**

System 310	With Monitor & Adapter	
Hard Disk Drives	VGA Mono	VGA Color Plus
40 MB-28 ms	\$4,099	\$4,399
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150 MB-18 ms ESDI	\$5,399	\$5,699
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**THE DELL 20 MHz  
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- Page mode interleaved memory architecture.
- Integrated diskette and VGA video controller on system board.
- Socket for Intel 80287 math coprocessor.
- One 3.5" 1.44 MB diskette drive.
- Integrated high performance hard disk interface on system board.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports integrated on system board.
- 3 full-sized industry standard expansion slots available.

#### OPTIONS:

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- 1 MB RAM upgrade kit.

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#### STANDARD FEATURES:

- 80286 microprocessor running at 12.5 MHz.
- 640 KB of RAM expandable to 16 MB† (4.6 MB† on system board).
- Socket for Intel 80287 math coprocessor.
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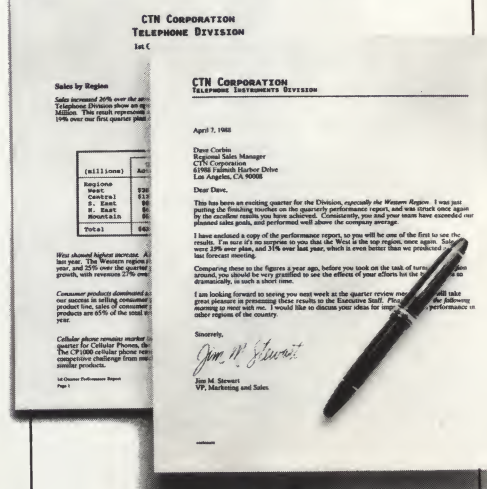
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Like being able to fine tune DESQview performance "on the fly." Run Lotus Express and Metro. And the Intel Connection Co Processor. Even use the DOS 4.0 shell with DESQview. Have DESQview automatically install Quattro, Sprint, Aldus PageMaker, Microsoft Excel, Word Perfect, Dataease and as many as 80 other programs. And using the DESQview API, be able to dynamically link them.

### More bang; less bytes

While other programs get bigger, we've worked to make DESQview smaller. And we've succeeded in a big way on PCs and PS/2's with extended, EMS 3.2 (AboveBoard), EEMS and EMS 4.0 memory—as well as on 386 PCs and PS/2s. For example, DESQview overhead on EMS 4.0 and 386 PCs can be as low as 10K on EGA/VGA PCs. And

For programmers, DESQview's API, with its strengths in inter-task communications and multitasking, brings a quick and easy way to adapt to the future. With the API's mailboxes and shared programs, programmers are able to design programs running on DOS with capabilities like those of OS/2.



DESQview actually increases memory 30K on CGA PCs; 20K on monochrome and Hercules PCs. That's good news for users of big desktop publishing, CAD and database programs.

### Introducing DESQview 386

For users of 80386 PCs and PS/2s (or PCs with 80386 add-in boards, such as the Intel Inboard 386), there's DESQview 386 (a combination of DESQview 2.2 and the new QEMM-386 Quarterdeck Expanded Memory Manager, version 4.2).

DESQview 386 gives you extraordinary power. Run text, CGA, EGA, VGA, and Hercules programs in windows and in the background. Run 32-bit 386 programs,

like Paradox 386, and IBM Interleaf simultaneously with your favorite DOS programs. All with the speed and performance you expect out of your 386. And with protection against 'misbehaved' programs.

### Promise and performance

And, of course, both DESQviews have all the features that made prior versions the popular choice in operating environments. The ability to multitask in 640K and beyond. View programs in windows or full screen.

Did you buy another environment that hasn't lived up to your expectations? Trade up to new DESQview. See coupon below.

Transfer data. Access DOS via menus. Dial your phone. And create keystroke macros within and between programs.

### Our story gets better and better

If there's any doubt about our commitment to your PC and PS/2 productivity, just look at our accomplishments over the years. We think you will understand why PC Magazine gave

DESQview its Editor's Choice Award for "The Best Alternative to OS/2," why readers of InfoWorld twice voted DESQview "Product of the Year," why, by popular vote

at Comdex Fall for two years in a row, DESQview was chosen "Best PC Environment" in PC Tech Journal's Systems Builder Contest.

DESQview lets you have it all now.



**DESQview System Requirements:** IBM Personal Computer and 100% compatibles (with 8086, 8088, 80286, or 80386 processors) with monochrome or color display; IBM Personal System/2• Memory: 640K recommended; for DESQview itself 0-145K• Expanded Memory (Optional): expanded memory boards compatible with the Intel AboveBoard; enhanced expanded memory boards compatible with the AST RAMpage; EMS 4.0 expanded memory boards•Disk: two diskette drives or one diskette drive and a hard disk•Graphics Card (Optional): Hercules, IBM Color/Graphics (CGA), IBM Enhanced Graphics (EGA), IBM Personal System/2 Advanced Graphics (VGA)• Mouse (Optional): Mouse Systems, Microsoft and compatibles• Modern for Auto-Dialer (Optional): Hayes or compatible• Operating System: PC-DOS 2.0-4.0; MS-DOS 2.0-3.3• Software: Most PC-DOS and MS-DOS application programs; programs specific to Microsoft Windows 1.0-2.1, GEM 1.1-3.0, IBM TopView 1.1• Media: DESQview 2.0 is available on either 5-1/4" or 3-1/2" floppy diskette.

Trademarks are property of their respective holders: IBM, OS/2, PS/2, Lotus, Express, Metro, Quattro, Sprint, Aldus, PageMaker, Intel, Above Board, Hercules, Mouse Systems, Hayes, Microsoft, Windows, Excel, Word Perfect, Dataease, Paradox 386, Interleaf, TopView.

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Qty	Product	5-1/4	3-1/2	Price Each	Totals
	DESQview 386 Multitasking windowing environment			\$189.90	
	DESQview 2.2 Multitasking windowing environment			\$129.95	
	DESQview 2.2 Upgrade from DESQview Version 2.0			\$24.95	
	Upgrade from DESQview 1.0 & AST Special Editions*			\$60.00	
	Upgrade from Topview, Windows, Visi-On, etc.**			\$65.00	
	QEMM-386 Version 4.2			\$59.95	
	QEMM-386 Version 4.2 Upgrade from QEMM 1.0-4.1*			\$19.95	
Shipping & Handling \$5 in USA/ \$10 outside USA					
Calif Residents add 6.5%					
Grand Total					

**Quarterdeck**

Quarterdeck Office Systems, 150 Pico Boulevard, Santa Monica, CA 90405 (213) 392-9851 Fax: (213) 399-3802

\* Requires DESQview or QEMM-386 registration card on file at Quarterdeck or included with upgrade order; upgrades free to owners who show proof of purchase after August 1, 1988. Quarterdeck priority service users: 33% discount from upgrade price plus sales tax and shipping/handling.  
\*\* Just present proof of purchase of any multitasking operating environment—the cover of your manual will do—and send it to us along with the appropriate payment plus shipping, handling and tax.

CIRCLE NO. 149 ON READER SERVICE CARD.



# PERSPECTIVE

Not long ago, personal computers belonged almost exclusively in the realm of technicians, analysts, and sometimes middle managers. Clearly, that's starting to change, and PCs are inching their way up the corporate ladder.



more informative. But our top executives are paid to be smart, not idiots.

More than 2,500 years ago, the Chinese philosopher Sun Tzu wrote that a good general needs to know three things to win battles: the condition of his troops, the disposition of the enemy, and the nature of the terrain. An executive's information needs are no different.

The beauty of the PC is its ability to support simple, logical, and rich exploration of data—offering new insight at each step. An executive must be able to “peel the onion” in successive layers, learning whether a revenue shortfall came from price or volume changes, in one or many products, in which channel or in which sales territory or in which type of customer. The same goes for exploring outside data on competitors, customers, or economic conditions.

In Herb Brody's article in this issue of *PC/Computing*, we meet several chief executives who have made PCs part of their personal battle plans. They're part of an important and growing new breed of executives who use computers to attack information to gain competitive advantage.

Being informed is, after all, how they became empowered in the first place.

Michael E. Kolowich  
PUBLISHER

More experienced computer users are becoming empowered and enfranchised in organizations, and more empowered individuals are seeking computer knowledge to grow and to fortify their positions.

It's interesting to see, then, how “executive information systems” are evolving.

EIS developers spend much of their time making systems more simple. Turn on a computer, see a menu, make a selection, and there, in living color, is a pie chart showing your market share. A line showing your stock movement relative to the Dow. A segmented bar exposing the Toledo plant's cost structure.

Many systems assume that executives are afraid of computers. It's easy, however, to confuse easy-to-use with trivial. Some executive information systems add little beyond what's already available through printed charts, and deliver basic data at higher cost and lower convenience. Executives find the systems seductively easy, but quickly lose patience with how little information they can actually get.

Somehow we got hung up on making information systems more “executive” (i.e., idiotproof) instead of making them

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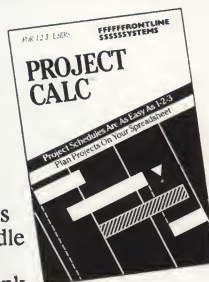
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Outline Gantt

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May 23, 1988

## INFO WORLD THE PC NEWS WEEKLY

### PROJECT MANAGEMENT SOFTWARE • REPORT CARD

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<b>Performance</b>	(weighting)				
Features/flexibility	(225)	Good	Good	Very Good	Excellent
Recalculation speed	(75)	Satisfactory	Very Good	Very Good	Very Good
Leveling speed	(50)	Satisfactory	Good	Very Good	Very Good
<b>Documentation</b>	(100)	Good	Very Good	Very Good	Excellent
<b>Ease of learning</b>	(125)	Very Good	Very Good	Good	Very Good
<b>Ease of use</b>	(150)	Good	Very Good	Very Good	Excellent
<b>Error handling</b>					
Data Integrity	(75)	Very Good	Very Good	Very Good	Very Good
Error messages	(25)	Good	Good	Good	Very Good
<b>Support</b>					
Support policies	(50)	Good	Good	Very Good	Excellent
Technical support	(50)	Good	Satisfactory	Very Good	Very Good
	(75)	Satisfactory	Good	Good	Very Good
<b>Value</b>		<b>6.2</b>	<b>6.8</b>	<b>7.2</b>	<b>8.8</b>

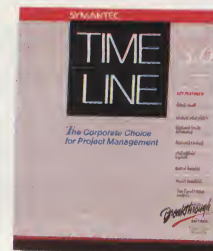
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\*Time Line is the #1 best-selling project manager (survey of National Distributors). It is also the #1 choice of 48 of the Fortune 50. Time Line 3.0 (\$595) received InfoWorld's highest 1988 rating for project management software (8.8). Time Line 2.0 (\$495) was PC Magazine's Editor's Choice in 86 and 87 and was rated #1 by Software Digest in 87. Training and consulting services, and links to CA-TELLAPLAN are available, call (415) 898-1919. © 1988 Symantec Corp, 10201 Torre Ave., Cupertino, CA, (408) 253-9600.

**PC** Editor's Choice,  
MAGAZINE '86 and '87

CIRCLE NO. 204 ON READER SERVICE CARD.



NORA

# G

E O R G A S



What does OS/2 have to do with basketball? Not a whole lot, except that basketball is the favored tension-breaking activity of a group of editors around here, especially when they're in the middle of putting together a piece like this month's cover story. Senior editor Fred Paul, who coordinated the efforts of fellow sr. eds. Paul Bonner and Preston Gralla and associate editor Randy Ross to produce our OS/2-a-thon, came to us from *High Technology Business* magazine, bringing his hoop madness with him. In his first weeks here, he required all staff members to stand up against his life-size (7-foot, 6-inch) poster of Golden State Warriors center Manute Bol. This was our first hint of Fred's particular talent for putting things in perspective.

As this issue goes to press, cover story coauthor Preston Gralla, who does battle on the court in a "Lute Society of America" T-shirt, is off in California, ostensibly researching his next story for *PC/Computing*. The piece will center on the increasing use of PCs by metropolitan police forces to solve crimes and track down their perpetrators. When last seen slinking out of the office, Preston was wearing a fedora and mumbling something about a falcon...

Meanwhile, Paul Bonner, whose lucid explanations of OS/2's inner workings and potential benefits rank among the best writing on the subject to date, has plunged into another complex standards issue, Extended Industry Standard Architecture. (The acronym EISA is pronounced—prophetically, we hope—"eeza.") An attempt by a group of major hardware and software companies—including Compaq, AST Research, AT&T, Hewlett-Packard, and Epson—to provide an alternative to IBM's Micro Channel Architecture, EISA is sure to get a lot of ink in the coming months. Bonner's exploration, scheduled to appear in an upcoming issue, will lead the way in helping readers to understand what yet another standard means to them.

They may be masters of the hoop, but off the court, Team OS/2 faced some hot competition from senior editor Carol Ellison, whose article on Japan's lagging efforts to gain prom-

inence in the software business was another strong contender for cover status. Ellison, a former newspaper writer and editor, started work on the piece intending to hand it over to an outside writer, but her enthusiasm for the topic was so evident we persuaded her to write it herself. Once immersed in the story, Ellison began to jockey for top billing, and for a while we thought she was going to drive her legendary Kentucky-mobile (a bright orange Datsun truck picked up at a police auction and "customized" by a high-school shop class) right into the high-fivers—which wouldn't be hard, since our basketball court occupies a corner of our parking lot.

After much deliberation, OS/2 made the cover, but we bring you both stories in this issue, lavishly illustrated and supported with insightful accompanying articles and tidbits that present useful analyses of two subjects that are high in the public consciousness. (Ellison will get another crack at the cover next month with her major story on what's wrong with the use of PCs in education.)

Having fulfilled our social responsibilities, we decided to have a little fun, and in this issue we're proud to bring you *PC/Computing's* First Annual Abort, Retry, Fail Awards—or ARFies—in which we salute the wackier side of PCs and their creators, promoters, and beneficiaries in America. We had a good time digging up anomalies, ironies, and the occasional display of bad taste; we hope you enjoy our choices. And remember, winners, as our parents used to tell us: we're laughing with you, not at you.


Finally, we celebrate Christmas with a pile of design-minded stocking stuffers that includes sleek laptop portables, chic calculators, fabulous phones, hot software, a gaggle of gadgets, and all sorts of sumptuous high-tech toys for yuppie girls and boys. Dig in!

Nora Ellison

EDITOR

PHOTOGRAPH BY RUVEN AFANADOR





# Get naked

## *ClearCase™ Mouse—Special Edition From Logitech.*

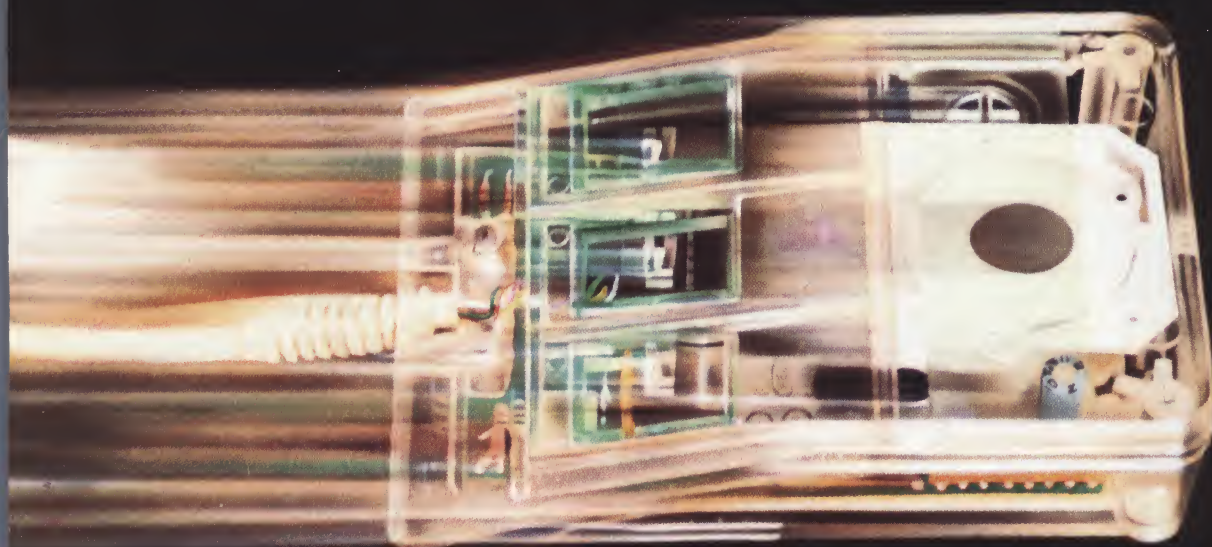
*To celebrate the shipment of our two millionth mouse, we took the covers off our winning technology.*

*But this mouse is a lot more than just a pretty case. It's compatible with virtually all mouse-based programs, plus you can program it to "mousify" any keyboard-based application. And it doesn't need resetting when you switch programs.*

*High resolution, adjustable cursor control, and a programmable 9,600 baud rate let you move the cursor quickly and accurately, even on detailed graphics—perfect for applications*



*for Christmas.*



*like PaintShow™ which, it so happens, comes with your ClearCase Mouse.*

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# LETTERS

## The Heart of the Matter

The relegation of the computer to a minor role as a data logger on the Jarvik artificial heart ("Hope and Glory: Men, Medicine, and PCs," September) may show a bias on the part of a large segment of the medical community. Most of a doctor's training is the memorization of facts to help him make a diagnosis. This storing, organizing, and analyzing data could be done better by computers—but this would make a large amount of medical education obsolete, and would probably drive down the cost of health care.

Jim Dwight  
Monroeville, Pennsylvania

"Hope and Glory" illustrates a three-dimensional, multi-angle viewpoint I enjoy—especially the fresh perspective of Dr. Robert Jarvik, the famed inventor of the artificial human heart. Some of our greatest inventions have come from those who strayed from the pack.

Craig Langley  
Stow, Ohio

I much enjoy your useful magazine. I was, however, amused by the cover of your September issue, which shows the aorta connected to the right heart rather than the left ventricle.

Richard Mintel, Ph.D.  
Assistant Dean  
University of Illinois College of Medicine  
Urbana, Illinois

*You have to admit our heart was in the right place.—Ed.*

## All Aboard

Your magazine is delightful. Thank you for catering to those of us who do more than affix our eyes and minds to CRTs, motherboards, and floppy disks. Your intuitive approach to the PC as an icon of society, and how such things as art, journalism, and the human psyche are affected by it, is truly refreshing. I urge

you to stick to your style. Hold aim to power thinkers, not power users.

Gregory M. DeLaere  
Flint, Michigan

## Power to the Little Guys

I have a problem with John Dickinson's article "386 Power to the People" (September) and with similar articles in other magazines. No author has thus far stated why the Compaq Deskpro 386S with its Intel 80386SX processor should be preferred to a standard 80386 computer (such as the Northgate) that offers performance equal to or better than the 386S's, but at a lower cost. Shall consumers now worship the Compaq label (no disrespect intended for a company that has proven its excellence repeatedly) as they once worshipped the Inflated Blue Machine?

Michael J. Krulik  
Schaumburg, Illinois

*You're comparing oranges and apples—and not looking for the cherries down the road. Dickinson's article made the apples-to-apples matchup: the 386S is already 30 percent cheaper than Compaq's lowest-priced 386 machine. A Northgate 386SX, when one arrives, will presumably be less expensive than a Northgate 386. The real promise of the 386SX chip is PCs at 286 AT-clone prices that offer some 386 features, like addressing more than 640KB of memory and multitasking using the 386's "virtual 8086" mode.—Ed.*

## Editor's Note:

*We've received many letters from subscribers who haven't yet received their DIRectory Magic disks. Don't worry: every charter subscriber will get the disk. If you haven't received yours yet, write to the Circulation Department, Ziff-Davis Publishing Company, One Park Ave., New York, N.Y. 10016, or call 212-503-3500.*

## Trouble in WonderLAN

I read your review "TOPS the WonderLAN" with some irritation. It all sounds so easy and carefree—enough so to make me wonder if anyone there had bothered to use the stuff, especially to use TOPS NetPrint to interface with PostScript printers. My experience has been frustrating in the extreme: fonts have inexplicably switched in the middle of a job; there have been innumerable crashes and endless garbage in the queue. Repeated calls to the technical support folks bring no useful help.

Bill Babcock  
Portland, Oregon

*The consensus around here (where, incidentally, we used the products extensively) is that TOPS file exchange and NetPrint are very easy to use. That's not to say we didn't have problems: learning to use our word processor's LaserWriter driver was one, and resolving conflicts among memory-grabbing RAM-resident utilities was another. We did not find TOPS technical support very enlightening on the latter issue, but then NetPrint is a memory-grabbing RAM-resident utility itself. The bottom line: if you want to print PostScript documents from a PC, TOPS is the easiest, cheapest way to do it.—Ed.*

## Upgrade Blues

About your "WordStar Goes Professional" article in the September issue:

The weeks go by, I want to cry:  
My WordStar 5 has not arrived.  
And like before with WordStar 4,  
There are copies galore in the local stores.

Harry V. Smith  
San Rafael, California

*Around this joint*

*We agree with your point.  
We can't understand  
Why a software man  
Doesn't make it his mission,  
Like a politician,*



	1986	1987	1988
Asset Exchanges (Note E)		\$28,500	\$17,598
Improvements	\$104,576	\$176,549	\$87,645
Installations (Note F)	\$4,500	\$17,500	
Additions to fixed assets	\$109,076	\$204,049	\$105,243

	1988
Income from operations	\$1,193,975
Interest and dividends	\$76,433
Income before income taxes	\$1,270,408
Provision for income taxes	\$472,000
Net income	\$798,408
Earnings per share	\$1.12

	1988
Land	\$258,087
Buildings	\$678,930
Fixtures	\$72,844
Machinery	\$201,456
Other equipment	\$19,465
Furniture	\$47,564
Vehicles	\$47,689
Patents	\$38,798

	1986	1987	1988
<b>Sources of working capital:</b>			
Net income	\$276,977	\$682,094	\$798,408
Non-fund charges to income:			
Deferred income taxes	\$32,872	(\$37,568)	\$105,246
Depreciation and amortization	\$79,832	\$96,267	\$983,654
Working capital from operations	\$389,681	\$740,793	\$37,699
Sale of fixed assets	\$68,476	\$74,867	\$34,866
Issuance of common stock	\$7,044	\$43,430	
Issuance of preferred stock	\$517,060		
Total sources	\$982,201	\$859,098	\$976,219
<b>Uses of working capital:</b>			
Additions to fixed assets	\$109,076	\$222,549	\$105,243
Additions to other assets	\$106,834	\$66,919	\$125,639
Dividends paid on capital stock	\$38,764	\$89,523	\$117,690
Total Uses	\$254,674	\$378,991	\$348,572
Increase in working capital	\$727,527	\$480,107	\$627,647

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Have you ever wanted to look at one worksheet while using another? Now you can. A special pop-up window lets you see a second worksheet with the push of a key.

	1986	1987	1988
<b>Sources of working capital:</b>			
Net income	\$276,977	\$682,094	\$798,408
Non-fund charges to income:			
Deferred income taxes	\$32,872	(\$37,568)	\$105,246
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Total Uses	\$254,674	\$378,991	\$348,572
Increase in working capital	\$727,527	\$480,107	\$627,647

You can scroll up, down, left or right, move and resize the window, swap sheets between windows, and cut and paste between sheets. And that's just the beginning.

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	Cash	Installment
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Eastern Region Sales		
Southern Region Sales		
Northern Region Sales		
Consolidated Sales		
Product Line		
Appliances	\$46,130,231	\$82,528,127
Automotive	\$11,250,162	\$4,598,066
Cooling and Heating	\$21,529,963	\$36,418,464
Hardware	\$28,213,431	\$8,355,814
Lawn & Garden	\$3,784,021	\$3,523,450
Lighting	\$1,466,185	\$838,383
Office	\$6,445,612	\$9,613,653
Outdoor Living	\$2,321,777	\$1,614,582
Pet Care	\$880,852	\$134,250
Sporting Goods	\$9,493,360	\$4,062,833
Total	\$132,879,599	\$146,469,062

regional sales worksheets to produce a national consolidation.

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# LETTERS

To keep his promises  
To the Tinas and Thomases  
Who bought his stuff  
When the code was still rough.  
We don't know the details  
Of the upgrade sales,  
But if you sent WordStar money  
We think that it's funny  
They've built up their new box  
Like cream cheese and lox  
While you haven't heard thus far  
A single WordStar.  
There's more to be said,  
But we'd better stop.—Ed.

## Readers' Rights

I am sorry to see that you are going to start censoring some of your ads just because they advertise "adult" software. I will never understand why it bothers someone who would never order such material just to see it available to those who would.

Richard A. Williams  
Green Bay, Wisconsin

Personally, I find organized religion offensive, but I would not object to a Bi-

ble-search program. Will you ban video games using violence next? How about workgroup software, which some view as fascist? If you desire to be a serious publication, please reexamine the serious implications of censorship.

Stephen Boursy  
Cambridge, Massachusetts

I must commend you on your decision not to advertise adult software. High-tech pornography is merely another computer virus plaguing the serious computer user.

Kevin M. Rachel  
Cleburne, Texas

I'm disappointed that you caved in to letters from a couple of moralistic individuals and changed your policy to disallow ads for "pornographic" software.

Daniel Tobias  
Shreveport, Louisiana

We didn't "cave in" to anybody. It's Ziff-Davis policy not to accept such ads; their appearance in PC/Computing was an error.—Ed.

## Touch That Dial

After reading "Running on Empty" (September "New!"), I was ready to buy Battery Watch. The deep-discharge option you describe is exactly what I need for my incredible shrinking NEC Multispeed HD battery. I have rapidly gone from a promised minimum of two hours to 20 minutes. How do I contact the company?

Jane Bliss Holtz  
Haddon Township, New Jersey

Battery Watch is available from Traveling Software, 18702 North Creek Pkwy., Bothell, Wash. 98011; 800-343-8080.

The article about shareware disks available from the Boston Computer Society ("Share," September) was interesting and informative. Where can I reach that organization?

Richard Richardson  
Deering, Arkansas

Write or call the Boston Computer Society, One Center Plaza, Boston, Mass. 02108; 617-367-8080.

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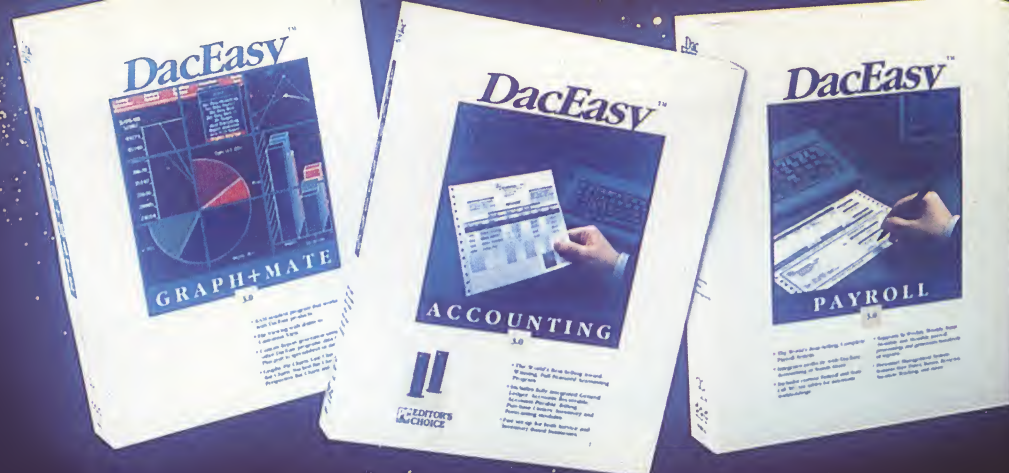
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# LETTERS

The article on French language software in "Learn" did not list the telephone number or address for Gessler Educational Software.

*Jerry Zentz  
Everett, Washington*

*Gessler can be reached at 55 West 13th St., New York, N.Y. 10011; 212-627-0099.—Ed.*

## The Path Not Taken

September's DOS column discussed Path commands without mentioning the Append command, which performs the same function for data files! I suggest two DOS columns: one for new users, one for experienced users.

*Michael E. Lippman  
West Chester, Ohio*

*The Append command is great if you're searching for a file, but be careful if you find it. Say you use Append to create a search path through several subdirectories containing spreadsheet files, then go into 1-2-3. You can retrieve a file without having to specify its subdirectory, which*

*seems neat. But if you change the data file and save it, it's not written back into its original directory. Instead, a new file is created in the current directory—probably not what you intended.—Ed.*

## Wordsworth

The final word on Microsoft Word ("Seymour vs. Dvorak") is a reminder that this program is brought to you by the same people who felt eight characters were sufficient for filenames—the same people who couldn't figure out a way to delete all files *except* the ones with commonality in their names—the same people who allow an operating system to take up 2MB of memory.

*Susan Quiroz  
New York, New York*

It is fine for Dvorak to criticize Word, but he shouldn't malign Bill Gates's reputation as a marvelous programmer. That's like me suggesting that Dvorak go to writing school because I disagree with his opinions.

*Michael de la Maza  
Irvine, California*

## Magic DIRectory Magic

DIRectory Magic is great. If you consider making improvements to it in the future, please consider these:

- Show the "Home" directory somewhere on the screen.
- Allow the use of DM.com with network directories.
- Show the "Find" line in the middle of the display and highlight it.

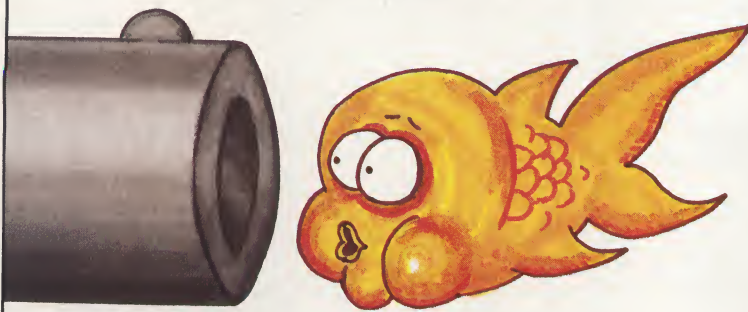
*Michael S. Raiké  
Marietta, Georgia*

Since DIRectory Magic reveals hidden files and also provides easy access to them, I have had to put it in a hidden directory. But to install it, I had to add the hidden directory to the Path statement in the Autoexec.bat file, ending the filename with "chr(255)." I would prefer that there be no visible evidence of hidden files. Is there a way to do this without sacrificing the accessibility of DIRectory Magic?

*Mark A. Dimmitt, Ph.D.  
Tucson, Arizona*

*The short answer is that if you have a file*

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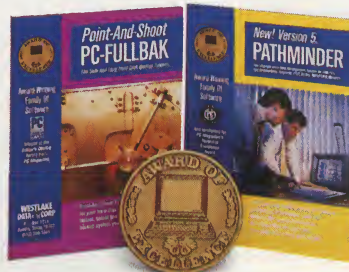
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### The Original Text...

There is a problem of a severe nature in widget production. It is clear that our current system will not cut the mustard. We may possibly need to move on this reasonably quickly. To start, it would be advantageous to see if a new design is doable. (This should be looked into at once.

- ### ...RightWriter's Analysis

There is a problem of a severe nature in widget production.      It is clear that  
 <<< U12. WORDY.      REPLACE problem of a severe nature BY severe problem >>>  
                          <<< S14. CONSIDER OMITTING: It is clear that >>>  
 our current system will not cut the mustard.      We may possibly need to move on  
 <<< U13. WEAK.      REPLACE our current system with a new one >>>  
                          <<< U13. REDUNDANT. REPLACE we may possibly BY may >>>  
 this reasonably quickly.      To start, it would be advantageous      to see if a new  
                          <<< S17. WEAK.      REPLACE reasonably quickly with as soon as possible >>>  
 <<< S13. REPLACE advantageous BY SIMPLER helpful or good? >>>  
 design is doable. (This should be looked into at once.  
 <<< U16. NOT A WORD. REPLACE doable BY can be done >>>  
                          <<< P11. IS THIS PARENTHESIS CLOSED? >>>  
 <<< S1. PASSIVE VOICE: be looked >>>

## &lt;&lt;\*\* SUMMARY \*\*&gt;&gt;

Overall critique for: C:\RIGHT30A\newtest.  
Output document name: C:\RIGHT30A\newtest.

READABILITY INDEX: 5.23

14th	12th	10th	8th	6th	4th
****	****	****	****	****	****
COMPLEX			-----GOOD-----		SIMPLE
Readers need a 5th grade level of education.					

STRENGTH INDEX: 0.78

0.0 0.5 1.0  
|\*\*\*|\*\*\*|\*\*\*|\*\*\*|\*\*\*|\*\*\*|\*\*\*|\*\* | |  
WEAK STRONG  
The strength of delivery is good, but can be improved

DESCRIPTIVE INDEX: 0.27

0.2                      0.5                      1.0                      1.2  
|\*\*\*\*|\*\*\*\*|\*\*\*\*|                      |                      |                      |  
TERSE                      NORMAL                      OVER                      DESCRIPTIVE  
The use of adjectives and adverbs is in the normal range

JARGON INDEX: 0.00

SENTENCE STRUCTURE RECOMMENDATIONS:

2. Few compound sentences or subordinate clauses are being used.
14. Many prepositional phrases are used.

<< WORDS TO REVIEW >>

Review this list for negative words (N), jargon (J), colloquial words (C), misused words (M), misspellings (?) or words which your reader may not understand (?).

ADVANTAGEOUS(J)	1	DOABLE(J)	1
NOT(N)	1	SEVERE(N)	1
WIDGET(?)	1		

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# LETTERS

with unusually sensitive information, don't put it on your hard disk—or at least give it an ordinary, unsuspecting name (e.g., Lotus.utl). You can also conceal files while keeping **DIRectory Magic** by creating a new directory exactly one level down from the root directory. Name it "chr(255)" and make sure that it is the last line on your Path.—Ed.

## Carbon Copy Callback

"Reach Out," by Frank Bican (August "New!"), was meritorious in pointing out the usefulness and versatility of remote communications software generally. However, the statement that only "two of these packages... offer an automatic callback feature that prevents direct access to the computer" is incorrect. Carbon Copy Plus has had automatic callback since Version 3.0 was released in September of 1986.

J. Owen Greeson  
Meridian Technology, Inc.  
Irvine, California

Should have called back on that one. Sorry.—Ed.

## Quicker Fixes

"Quick Fixes" (September) neglected to mention one of the most common sources of hardware trouble: the fuse or circuit breaker. One should be careful in just replacing a fuse or resetting a circuit breaker. There is usually a reason for their blowing.

Ron Bello  
South Natick, Massachusetts

Thanks for the advice.—Ed.

## Trade Wars

Three cheers for higher DRAM prices ("Unfair Fair Trade," September), greater American growth, and security for our products. Yes, the Japanese are doing well for now, but with continued U.S. growth and restrictions on imports, the trade war will soon come to an end. The subsidies and chess playing will all be for naught: the Japanese will have to come out of their caves.

R. Nazarete  
Califon, New Jersey

Uh, okay.—Ed.

## Reinventing Education

Isaac Asimov talks about a revolution in education using computers that will allow Johnny (Jane, too) to pursue his or her own interests and stimulate his or her creativity. But Asimov fails to address the sad state of education in this country today. Without a common foundation of basic education, creativity serves no purpose.

Rick Lawler  
Sacramento, California

We agree. Watch for our special report on education next month.—Ed.

## Correction:

In our September review of French language software, we incorrectly identified Gessler Educational Software as the publisher of all three programs. "Ticket to Paris" is published by Blue Lion Software, 90 Sherman St., Cambridge, Mass., 02140; 617-876-2500.

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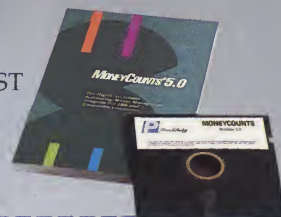
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JOHN C.

# D V O R A K

**W**hen you meet Neil Larson you have to wonder about the effects of computers on certain people. They're obviously not trivial.

Larson runs a small software firm in Berkeley, California, called MaxThink. His company makes computer-aided thinking tools, and it takes skill to get him to talk about anything else.

Larson was born in Oregon in 1939 and holds a math degree from Berkeley. He got an M.B.A. in marketing from Stanford and shortly thereafter became interested in direct mail marketing. He's now running his fourth direct mail marketing company. Each has had sales of more than a million dollars.

Larson's first venture was a business that sold ear tags for cows. After that scene became boring, he sold survivalist gear to the nutballs holed up in the woods. This was long before it was fashionable to become a survivalist nutball and go hole up in the woods.

From there it was Reliance, a mail order "investment" diamond business that once sold \$10 million worth of diamonds in a month. "About when the greed factor peaked," says Larson.

I first met Larson about ten years ago, when he was still in the diamond business and was just discovering microcomputers. He had already invented the first computer outliner I ever saw (marketed years later as MaxThink), and he was getting interested in the mechanism of thinking.

Larson has since moved from his mansion in upscale Piedmont, Califor-



nia, into upper-middle-class Kensington, where he lives with his wife and their six children in the house he was raised in. He misses neither Piedmont nor diamond selling.

"While the diamond business was lucrative," he says, "I'd like to contribute something to society."

Larson's preoccupation is with developing software that can be used to organize, classify, sort, and convey knowledge. "Until now, all computers did was

You never see any of this stuff advertised, and it's not in stores. "Too hard to explain," Larson says. "I'm strictly word of mouth. I want to have 20,000 customers on a first name basis rather than let things get out of control. This is not a product, it's a religion."

Larson goes on to rave about the concept of a "zippered" list, where data can be strung together in weird ways. He talks about a "mandala" outliner using a peculiar oriental hierarchical system to create an eight-way structure. He talks about the flaw in the Apple HyperCard system: "Just batch files with icons!" And the flaw in Ted Nel-

**It's as if Larson were on a mission from God. He's had a glimpse through a door to a different reality.**

process information," he says. "This is a low-level activity. Computers are just a bigger crank on a calculator. Using Lotus is just a different form of picking cotton. How can a computer help you access and transfer knowledge? That's what's important. It can't be done with mere processing. You can't find anything. You can't browse. You can't discover." Larson's arms usually go up in the air when he talks like this.

He'll tell you that the key to the future is hypertext. And he thinks his company, with its MaxThink Outliner/Idea Processor, Houdini Expert System Builder, and HyperLink and PC Hypertext packages, is on track to that future. He plans soon to come out with a complete word processor based on a hypertext concept.

son's proposed hypertext system: "Infinite undo and infinite sliceable copyright royalties. It's an incomplete vision." There go his arms again.

Larson is wound very tight. It's as if he were on a mission from God when he explains the importance of semantic taxonomies. Then he shows you a cute utility called PERM, which can take three MaxThink outlines and turn them into a 100-rule expert system in 15 seconds. In fact, Larson's entire approach to information processing is so different that you wonder if he's an overlooked genius, a maniac, or just someone who's had a glimpse through a door to a different reality.

It's also possible that Larson is all of the above. Whatever the case, I like his style. ■



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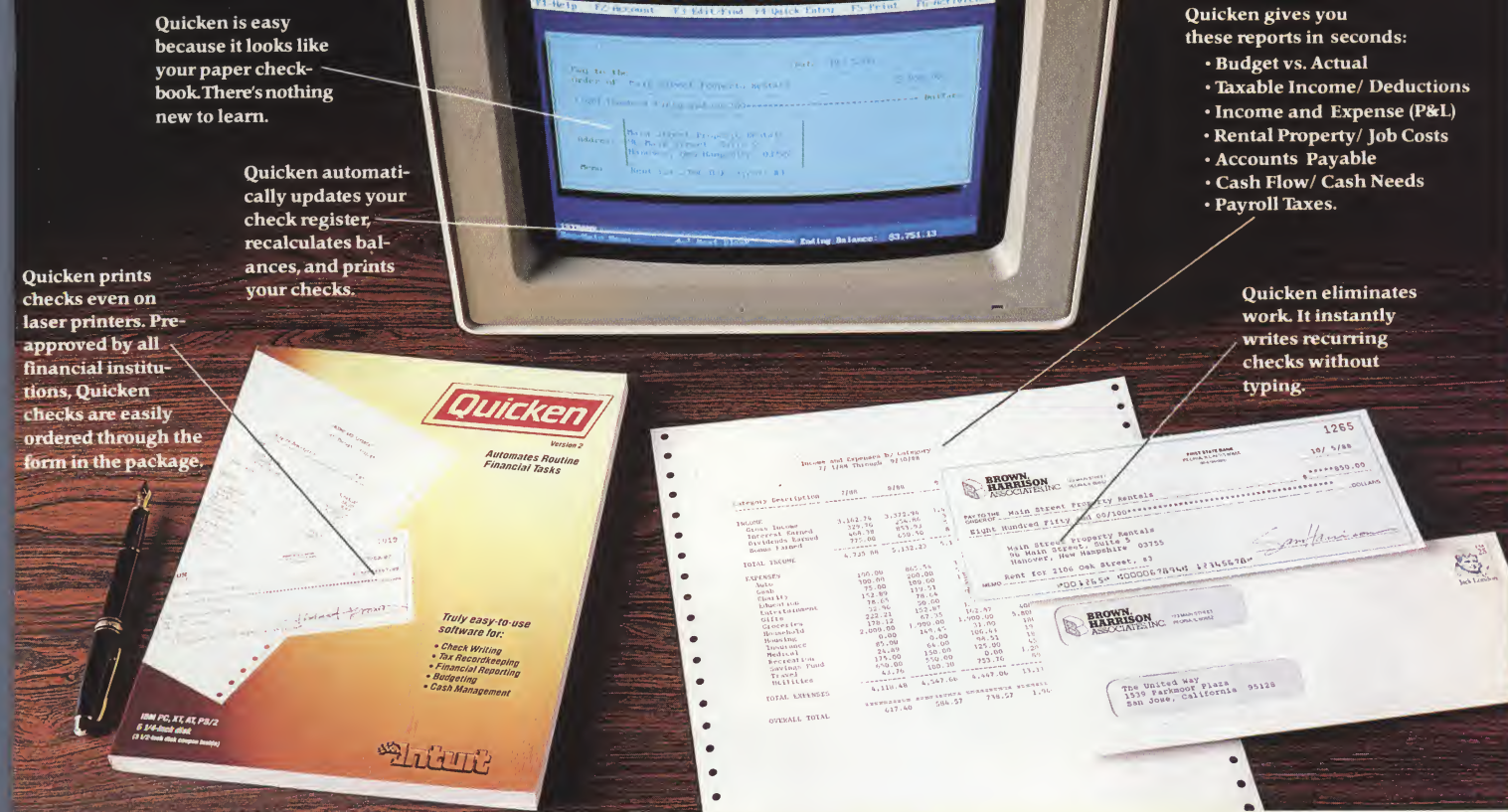
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ESTHER

# D Y S O N



**S**teve Jobs and others said it long ago, and it's been conventional wisdom ever since: the PC should be an appliance—albeit a small, friendly appliance that you can have a close personal relationship with. It should do your bidding, store your data, and help you to do your work. It should have a user-friendly interface, with icons and bit-mapped graphics, so it can show you pictures and diagrams as well as text. You give it data, it calculates. It gives you the answers.

But it would be crazy to waste all the power we're going to pack inside that cute little box on communicating with a single slow-thinking, slow-typing human being. Instead, your computer is going to be hooked up to a network of other PCs and bigger, more powerful computers, and it will spend the majority of its time interacting with them on your behalf.

The PC of the future is not going to spend most of its time talking *with* you; it's going to spend most of its time talking *for* you, and reporting to you from time to time on what's going on or asking for further instructions.

For starters, it's going to act as a reliable, efficient secretary, scheduling all your appointments, returning your telephone calls, and paying all your bills—all according to rules you've set up in advance. It will also serve as your researcher, regularly searching databases for the kinds of information it knows you want. You will probably give it some general guidelines, and then it will

refine its criteria by watching which kinds of information you tend to save and which kinds you usually discard.

Day and night, your computer will be out there, working almost full-time to keep you abreast of what's going on. But most of the time it won't even bother you with the details. It will just handle things by itself—routinely, automatically, without fail. It will save you from having to deal with the nitty-gritty details of anything you

tions to their computers on how to handle *you*—or your computer and its instructions, that is.

Sound a little like Mr. Reagan's Strategic Defense Initiative? It is. Even as you're telling your computer what sorts of messages to ignore, clever programmers will be devising ways to get past all your defenses. (A message like "You may already have won a million dollars in our sweepstakes" would be far too obvious for most of us, but "I have a great new groupware package" might get past *my* guardian.)

The result of all this will be interesting to watch. If you've thought about

**Even as you tell your computer how to handle others, others will tell their computers how to handle you.**

can anticipate and will handle them without you. It will be able to handle and resolve many more situations and much more information than you could ever find the time to ignore if they actually came your way. Rather than tell it what to do in each particular situation, you will tell it what rules to follow in all situations. Instead of manipulating your computer, you will be able to delegate to it.

But these are merely tasks. The real shift will be a sociological one, whereby your computer will actively look after your interests in a world populated with computers looking after other people's interests. Even as you're instructing your computer how to handle various types of messages and situations, other people will be giving similar instruc-

hot new science concepts such as chaos, you have to wonder what will happen. Far from being deterministic like the computers (as we perceived them) of old, this new world of autonomous computers may well operate in fundamentally unpredictable ways—just as the ultimate effect of a butterfly flapping its wings in Barbados could be Hurricane Gilbert.

Of course, there's not really any way to simulate this sort of thing. The only way to predict the sociological implications of this shift will be to run the software—and that's not prediction, it's experience.

Maybe we too are just simulations of complex, unpredictable *software* running in real time. (Try that one out on your mother.)





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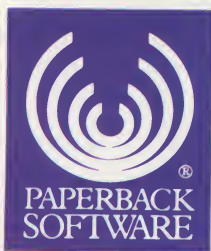
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PAUL

# S O M E R S O N



**I**t was getting late; I could hear the night watchman's TV playing the "Star Spangled Banner." Another all-nighter at the keyboard trying to get the last few kinks out of a five-year programming project code-named "Carol-Ann." The first time it was nearly done, we had to rewrite it for LIM 3.2. Then, when that was finished, the release was postponed to work with EMS 4.0. And now we've been toiling for months to convert the thing to OS/2. It never ends.

I'd spent half the night installing a speech synthesizer so I could test the program's output while I pored over printouts of the code. A thunderstorm was headed my way, so I wanted to finish before any lightning struck.

Originally, getting the thing to work with plain vanilla DOS had been hard enough. I was fighting to make the software less complex, easier to use, and more intuitive, but by the time the marketing department got through with us we were throwing in so many bells, whistles, and other geegaws that it took 640KB just to load the opening menu.

However, now that we had fattened the feature list, future users would be able to have numbers appear in any of 2,000 typefaces—and rotate them on the screen in 2-degree increments. Our competition's product allowed a paltry 800 numerical type fonts and far cruder 6-degree changes, so we had more than doubled their product's abilities—although our program did run a little slower because of the increased overhead.

Converting it to OS/2 meant rewriting just about every one of the program's terse, elegant assembly language routines into fatter C code. Which meant retraining the entire programming staff and coming up with a whole new development toolkit. And because we had heard that the competition was adding a natural language interface, we were hastily throwing in our own, slowing the process even more.

Rain pelted angrily against the win-

dow. The hard disk tree structure mysteriously appeared onscreen. Then, as I watched in horror, the subdirectory tree reached out, grabbed my copy of the Carolann.c source code, and vanished, leaving a lonely "General failure error reading drive C:" message on my screen and a feeling of dread in my stomach.

A newly hired MIS technician came by the following morning.

"That's awfully strange. Something just came in here and physically stripped the magnetic coating right off the hard disk platters. What were you doing right before it happened?"

"Getting it to run under OS/2."

**"So it's happening here too. Just like what went on at my last job. It's the operating system from hell..."**

dow as the thunder boomed closer. I was reaching for the preliminary manual, which had already mushroomed to well over a thousand pages, when a fulgurous blue bolt flashed through the window. My screen made an eerie whining sound and went blank. Nothing but strobing confetti. I stared at it, trying desperately to recall whether I had saved all the changes I had made, when the speaker suddenly piped up:

"They're heeere..."

Huh? Who was here? Out of the corner of my eye I noticed that something or someone had stacked all the floppies in my office into a tall pyramid. What was going on?

I rebooted, hoping my hard disk was unharmed, as I made a mental note to do a backup one of these days. A map of

He gasped. His eyes grew wide. He made the sign of the cross, then leaned over and whispered, "So it's happening here too. I knew it. Just like what went on at my last job. It's... the operating system from hell..."

The speaker beeped twice. We both stared at it. It chirped into action. "Help me! They're all around me..." Disks began whizzing through the air. In a picture on the wall, Peter Norton uncrossed his arms.

The technician grabbed my sleeve. "This is a side of nature neither you nor I are qualified to understand. I'll call Dr. Spielbug at the Institute..."

Hours later a short, squat woman with a voice like Truman Capote's appeared in the doorway, picked up a floppy, and sniffed it. "I can feel the

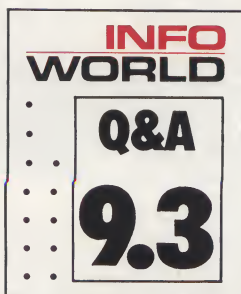




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## SOMERSON

psychotronic energy. Your program is somewhere inside this office."

"What's going on? Will I be able to rescue my source code?"

"When I arrived I assumed your office was simply haunted. But now I think what we have here is a... poltergates."

"A what?"

"A poltergates—from beyond the realm of reason. There are dark forces at work here. How else can you explain the astonishing success of DOS—an operating system that's horribly cranky, crippled, and difficult to use? One that lets you wipe out files by copying older versions over newer ones with the same name? One that won't let you compare the contents of files with different lengths? Or that runs in drab black and white on expensive color monitors? Or that makes you use slashes and backslashes in the same command? Do you think this could have happened without an evil influence?"

"Well, I guess not, but the immediate problem is to recover my file. Can you help me?"

"It depends on how serious the problem is. Have you seen any recent manifestations of this evil?"

I pointed to the bulging shelf of applications packages behind me. "As a matter of fact, just this morning something replaced all my software with earlier, buggier versions and reformatted all my floppies to DOS 1.0."

We heard a low, mournful moan. The screen began to twitch. An increasingly bright light poured from it. Then a pale half-bird, half-demon apparition sprang from the glass, shrieking.

I hid my face in my hands. "My God... what is it?"

"It's the soul of tortured PC users," Dr. Spielbug said. "Of millions of accidentally formatted hard disks. Of corrupted data and files mysteriously lost forever. Of unlabeled dip switches and incompatible disk formats and missing printer drivers and wretched manuals. Of millions of hours of pure, raw frustration. We must act quickly..."

She grabbed a modem cable and fed it into the drive slot. The end wriggled out a hole in the back of the chassis. She turned to me in a trance. "Now grab the end of the cable and pull when I tell you. Do exactly what I say or you may never see your program again..."

I reached out and took hold. The electricity from a decade of garbled and accidentally disconnected modem sessions coursed up and down my arms.

The speaker crackled, and a distant, familiar voice screamed, "Hurry, please, it's taking bytes out of me!"

I panicked and yanked hard on the wire. The screen became incandescent. The motors inside the chassis started thrashing the machine up and down. The printer began spewing paper.

Dr. Spielbug grabbed my sleeve. "No! Not yet!"

A cloud of vapor hissed out of the monitor, followed by an enormous, menacing head. Despite its boyish, bespectacled Harvard looks and its shock of uncombed blond hair, it was terrifying. The poltergates...

Dr. Spielbug shouted, "Now! Pull!"

I tugged on the cable with all my strength. The computer shuddered and began flinging ancient objects from the drive slot: 8-inch floppy disks, 16KB memory chips, 8-bit CPUs, a TRS-80 Model I manual. And then, finally, a handful of 5¼-inch diskettes covered in red protoplasmic slime.

"Carolann.c!"

The noise subsided. The terrible head vanished. Dr. Spielbug smiled smugly. "This system is now clean."

"W-w-what caused all this?"

"It's OS/2. The people who created it told everyone that all other operating systems were dead. Then they used their otherworldly influence to try to bury these older operating systems. *But these weren't yet dead.* They built their new system on top of older ones that still had much life in them. These older operating systems linger in a perpetual state of neglect and abuse—a nightmare from which they cannot awake..."

"You mean like being trapped in an elevator with an insurance salesman?"

"Worse. A terrible rage is out there. So much pent-up frustration. It was strong enough to punch a hole into this world and take your program away. It lies to you; it says things only a user hungry for power will believe."

I wiped the red gook off my disks. Oh, no, 160KB single-sided floppies. I'd be merging parts of the file all day. "Is the poltergates gone?"

"No, it will keep coming back, keep spreading the lie. There's only one solution."

"Stay with DOS?"

"Unfortunately, the power behind OS/2 is too strong. No, the only answer is to involve Tipper Gore. She'll convince the manufacturer to put the offending source code for OS/2 on the outside of the package. Only then will we be safe."







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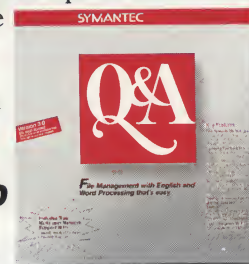
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# JIM S E Y M O U R

VS

# JOHN C. D V O R A K

**W**hen shareware wasn't looking, most of its "market" went away. But that wasn't much of a loss.

Of course, these days "shareware" has become a pretty ambiguous concept. The tangled history of terms such as freeware, shareware, and PD software would take too long to recount here, but we can fairly credit people like the late Andy Fluegelman (PC Talk), Jim Button (PC-File), and Bob Wallace (PC-Write) with fundamental, structural contributions to the development of the field, as well as with writing three popular shareware programs.

Indeed, hundreds of thousands of PC users still plug away with PC Talk for communications, PC-File as their database software, and PC-Write as their word processor.

But none of those three—nor very many of the thousands of other PC software packages distributed as shareware—comes near the current standards for good commercial applications software. Which is the fundamental reason for the decline of interest in shareware.

The cause of that decline would be hotly contested by Wallace, by Button, and by Fluegelman's widow, who run enterprises based on selling their shareware products. They'd argue that all are successes.

But the fact that they're now *selling* those products points to another of the reasons for the decline of shareware: the need to make a living. From Red Ryder on the Mac to ProComm on the PC, interesting and sometimes good programs have grown up out of the shareware field. In the last five years shareware has turned into something like Class D baseball used to be in the United States: an easy-entry minor league for those with big-league aspirations.

Few ballplayers survived the trial-by-bus of the Class D baseball leagues. Most decided after a while that \$50 a week and all the pain you could stand were not what they wanted out of life.

Shareware programmers have been making the same discovery, with the result that almost *(continued on next page)*



**Shareware: alive and well, or on the road to a well-deserved obscurity?**

**I** am shocked by what Jim has to say about shareware. What I see from Seymour is a nasty, patronizing explanation of shareware's so-called decline.

Shareware is a simple concept: you take a

copy of some software from a user group or library and try it out. If you like it, you pay for it. Unfortunately, the simplicity and elegance of this concept eludes those lovers of massive corporations—those who are attached to the concept that bigger is always better.

The little guy without a publisher who

attempts to sell his software code as shareware should simply be squashed into the mud. Or so say the critics.

Well, it ain't so. No matter what Jim says, shareware is alive and thriving. I'm amused at his notion that ProComm, for example, became commercial because it couldn't survive as shareware. This is malarkey. Many shareware vendors start with shareware in order to test the market. If a product takes off like a rocket, then they can spin it into an enterprise. It's a no-risk approach to software marketing that should be encouraged, *not discouraged!*

All of the most famous software vendors became millionaires before they went commercial. To suggest otherwise is naïve. Years ago I talked to Scott Watson, of Red Ryder (a shareware product for Macintosh users) fame, and he had already registered 40,000 users at \$40 each. Today he has easily gone beyond 100,000 registered users. You can tally the numbers yourself and then tell me whether shareware is a dumb idea.

The fact is that shareware is a great way to start a company. Jim's contention that shareware isn't commercially acceptable is contradicted by his own admission that ProComm is a top commercial product. There are others out there as well. There are spreadsheets, word processors, general ledgers, and many utilities. All of commercial quality. All available at your local user group.

One issue ignored in all this arguing is the benefit of shareware to both the user and *(continued on next page)*



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# ACCOMPLISHMENT.

## SEYMOUR

every shareware program that has become widely used and admired—including all those mentioned here—have now gone commercial. Their authors often tell me that's because people like you and me didn't support their work when it was distributed as shareware: we ignored those sign-on screens urging us to send \$35 to \$40 if we decided to use the programs on a regular basis.

So in quiet desperation more than in greed, they brought their products to the commercial software arena. The ProComm people spent almost \$100,000 last spring rolling out their commercial version, ProComm Plus. That move paid off handsomely, but ProComm's market success has a lot more to do with the fact that ProComm Plus is a great product than with its origins in the shareware community.

The financial aspects, however, aren't what interest me most here. Rather, it's the rise in our collective expectations for software, and the way those rising expectations have foreclosed on the future of shareware.

As much as I like Bob Wallace's PC-Write, I wouldn't use it in place of Microsoft Word or WordPerfect. I like Jim Button's work, but the current version of PC-File Plus still doesn't approach the convenience and functionality of the flat-file product I use regularly, Q&A. (To say nothing of the relational DBMS upon which I rely for the tricky stuff: Paradox/386.)

I could go through other product comparisons, but they're unnecessary. We all know that shareware almost never matches up to the best commercial products available.

When PCs were less important to our work, less interesting in our personal lives, we used whatever we could find. Shareware fit the corporate-guerrilla model that brought the first PCs into many companies; it fit even better the hobby role personal computers played for many of us then.

Today, as PCs have become *very* important both in our work and in our time away from the office, we want the best software more than we want the most economical software.

There will always be a demand for shareware among some PC users, and I hope there will always be about shareware that air of exuberance and hope found in the minor leagues.

But I cannot fail to notice that there aren't any Class D minor-league ball clubs left. And I fear shareware may follow that same path to obscurity.—JS

## DVORAK

society as a whole. Maybe Seymour can afford to throw money away, but most users can't. Many users scrimp to buy inexpensive clones and then must rely on public domain and shareware products to complete their systems.

Shareware is the most cost-effective way to begin computing. Seymour and the other elitist critics of shareware would rather have such people die behind the counter at McDonald's than

**Much shareware has little value, but the same can be said about many of the commercial products on the market.**

allow them easy entry into the world of personal computing. This elitism has always been a theme in the world of computing: the high priests find it satisfying to keep other people from learning about computers. I suppose it makes you feel better if you can lord it over someone.

Well, I, for one, ain't going for it. Shareware is an important and necessary aspect of the personal computing scene, and it should be encouraged and promoted. While I cannot disagree that much shareware has little value, the same can be said about many of the commercial software products on the market today. So what's the point of that criticism?

I urge users to find out for themselves. Go to a local user group and explore the program library. Look at QubeCalc, Qmodem, and the many nifty utilities available. Despite what the critics of shareware expound, there's a software gold mine out there.

Finally, when you hear this nonsense about shareware software being of non-commercial quality, remember that there are but few software publishers who will even look at outside submissions, and that the majority of those publishers are interested only in games. The unfortunate dark side of Seymour's argument is that in most cases there is no alternative for the vendors of shareware. They hold down full-time jobs and are not interested in starting their own software companies just to market their codes.

For these talented souls, shareware is a wonderful concept. May it never fade.  
—JCD



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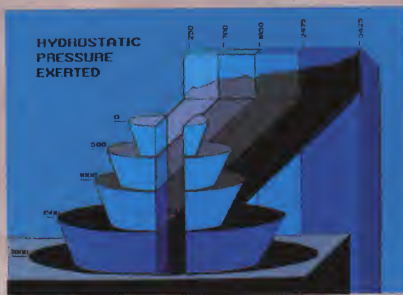
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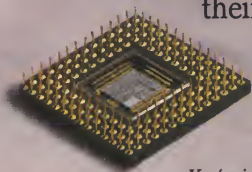
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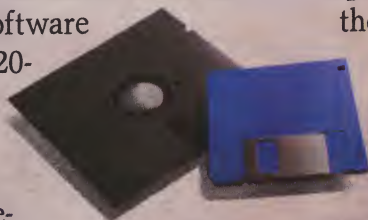
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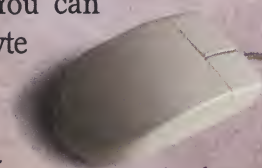
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Lotus 1-2-3  
Help

COPYING AND MOVING -- GUIDELINES (pg 2 of 3)

Relative Reference in Copied Cell

+A1 ----> +C2      Relative formula adjusts to new position.

Absolute Reference in Copied Cell

+\$A\$1 ----> +\$A\$1      Copying has no effect on absolute reference.

Mixed Reference in Copied Cell

+A\$1 ----> +C\$1      Relative reference A adjusts to C.  
Absolute reference \$1 does not change.

continued...

-More Information - Position Cursor and Press Enter  
F1-Done with Screen  
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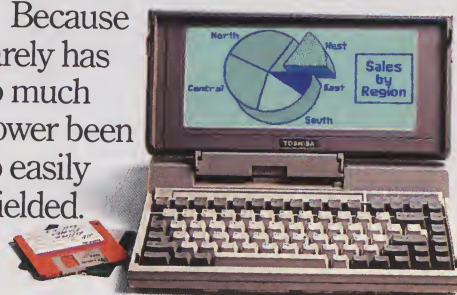
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# WordPerfect 5.0 Users...Choose Sides

## WORDPERFECT 5.0 DISPLAYS MULTIPLE

These Characters Are Shown

**Boldface** and underline look fine, but

Does your Italics look like this

Before, you couldn't tell whether

An outline font is good for titles,

It is important to be able to tell

And Small caps and double underline

Redline is designed to

When you want to display different

YOU USED TO HAVE TO GUESS, BUT

## FONTS USING HERCULES RAMFONT CARDS

WHILE WRITING AND EDITING.

**what about** all the other possibilities?

*or can you really see italics?*

you had typed subscript or superscript,

only RamFont lets you display outline.

~~strikethrough~~ from underline.

Do NOT HAVE TO BE so confusing.

help you **see changes**.

character sizes: Ee Ee Ee Ee Ee Ee

NOW YOU CAN SEE WHAT YOU MEAN.

Doc 1 Pg 1 Ln 1" Pos 1"

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For more information about how Hercules improves WordPerfect 5.0 and other favorite programs, call toll-free 1-800-532-0600, ext. 933 (U.S.) or 1-800-323-0601, ext. 934 (Canada).

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is the perfect gift  
for the 5.0 user  
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## Word Jumps Ahead ... Again

One of the most interesting battles in the PC software business has been the back-and-forth contest between Microsoft Word and WordPerfect. Along with IBM's DisplayWrite 4, they hold the top slots in PC word-processing software sales. But unlike DisplayWrite—which is a hard product to take seriously, and one that sells mainly because of the pixie dust that falls from the letters I-B-M in some companies—both Word and WordPerfect have gained their market leadership on merit.

The release earlier this year of WordPerfect's new version 5.0 pushed it ahead of the then-reigning features champ, Microsoft Word 4.0. Now the boys from Redmond say they're serious about retaking first

place, at least in the features race, with Word 5.0. (We worked with a pre-release copy of Word 5.0 for this product preview.)

WordPerfect 5.0 introduced much better mixing of graphics and text. The new Word version matches WordPerfect's features, making inserting graphics a couple of keystrokes easier. Graphics can easily be enlarged or reduced, too—but watch out for the proportions of artwork you resize: when you tell Word 5.0 to make an imported graphic narrower, it isn't smart enough to also shorten it.

The improved mix of text and graphics involves one of the strengths of Word 5.0: a print preview feature. With other PC programs that preview finished pages, the time required to ▶

## Hewlett-Packard LaserJet IID Prints Both Sides of the Story

**H**ewlett-Packard made its mark on PC output with the LaserJet laser printer family. Now, the LaserJet is making its mark again, this time on both sides of the paper. The LaserJet IID, the latest offering from HP's Boise, Idaho, printer division, offers full duplex printing capabilities.

Duplex laser printing is nothing new—if you had \$25,000, you could buy a laser that printed on both sides of a single sheet of paper. The IID, however, makes duplex printing affordable at \$4,295.

The heart of the IID is a new Canon laser printer engine. Based on Canon's older and now ubiquitous LBP-SX engine (used by HP, Apple, and many other manufacturers), the new engine—and therefore the IID—offers text resolution of 300 dots per inch and

can print up to eight pages per minute in simplex (single-side) mode.

The IID is compatible with earlier LaserJet and LaserJet Series II printers. Font cartridges, printer drivers, and paper trays for the older models can be used without modification with the IID.

HP reengineered the paper path on the IID to accommodate and speed duplex printing while fitting it into a reasonably sized package. As a result, the IID is only slightly larger than earlier HP lasers and prints up to 7.4 pages (on the front and back of four sheets) in a minute.

The IID incorporates a second paper tray that gives it a capacity of 400 sheets, double that of the Series II. An optional (\$350) automatic envelope feeder ▶

### INSIDE NEW!

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**LaserJet IID** *continued* serves as a third paper source. The combination of the two trays, the envelope feeder, and the printer's ability to pull paper from trays consecutively lets users print letters and envelopes in collated fashion.

The IID comes with

640KB of memory, which can be brought up to 4.6MB with an optional memory card—enough to print full-page graphics at 300 dpi in duplex mode.

All of the IID's print

**HP's LaserJet IID brings duplex printing to the PC.**



#### **Word** *continued*

draw page images on your screen limits the usefulness of the feature. But Word 5.0's preview mode succeeds in showing all elements, including large headline-size type, smaller body type, and graphics, in the correct position on the page. You can choose a one-page or two-page display; PgUp and PgDn scroll forward and backward through the document.

Other changes? Word 5.0 (finally!) shows side-by-side columns onscreen and allows you to edit the work in that form. It lets you set tabs directly on a tab ruler and shows the effect of those settings immediately, making it easier to line up tabular material. Loading stray documents is now easier with an expanded document-directory view facility.

Finally, Word lets you set default margins for your documents the way you'd expect to set them. It's al-

ways been possible to set defaults for margins in Word by editing the Normal.gly glossary file, which is present on the program disk and automatically read by Word every time you begin a new document. But lots of Word users found that tricky; it's now an easy, obvious menu choice.

Overall, Word 5.0 doesn't offer the huge leap in convenience, speed, and power that Microsoft delivered in Words 2.0, 3.0, and 4.0. But maybe the days of cosmic leaps are over, and incremental improvements are the order of the day.

In any case, WordPerfect 6.0 can't be far behind, so the race between the two giants of PC word processing will surely continue its zigzag course.

The price of Word 5.0 will be \$450, the same as 4.0. Microsoft, in Redmond, Washington, can be reached at 206-882-8080.

—Jim Seymour

functions—including the 24 standard fonts, portrait or landscape page orientation, and paper handling—can be set from the printer's front control panel. HP is talking to software developers about incorporating these software-selectable functions into their applications.

If your printing needs are complex and your paper handling, storage, and waste immense, HP offers an affordable answer. Its output is as good as that of any laser based on the SX engine, and its paper-handling and duplex capabilities put it a step ahead of the others.

But expect to see some competition in the months ahead. The IID is the first to use Canon's new engine, but Apple and others will no doubt follow suit. To get a look at low-cost duplex printing and the new LaserJet IID, call 800-752-0900 for the location of a nearby HP dealer. —Chris Shipley

## EISA: The Busing Battle Continues

**T**he PC compatibles industry took a big step forward recently with the announcement of the Extended Industry Standard Architecture (EISA) specification for 32-bit bus design.

Even before IBM introduced its Micro Channel architecture, which uses a radically different bus design from earlier PCs, XTs, and ATs, compatibles manufacturers were telling anyone who would listen that the PC was no longer IBM's standard, but rather a de facto industry standard reflecting the enormous installed base of PCs.

That argument seemed to hold water in the aftermath of the release of Micro

## Of Mice and Scan

We've pondered the mouse and racked our brains, wondering why a PC user might really need one. We've seen enough handheld scanners and optical character readers to cease to be impressed. But Marq Technologies has put these ideas into a singular package that has made us think again.

The MarqSystem starts with a serial mouse. The 600-dpi device has four programmable buttons, custom menuing software, and definable cursor control. But close examination reveals an odd quirk: a gate in front that accepts add-on devices.

The first of these devices is the MarqScanner, a transparent, bladelike at-

tachment that makes the system look more like an ice scraper than an input device. The Scanner can input 16 levels of gray scale at 300 dpi and includes a rotation sensor that "understands" your starting position on a page and lets you scan images larger than the device by using a continuous paintbrush-style movement. (Many handheld scanners require you to scan an image in strips, then "paste" them together onscreen.)

If OCR is your scanning requirement, the MarqReader pops into the same front-end gate. The Reader can recognize mixed fonts of alphanumeric text and includes audio feedback that lets you proofread data as you scan it. The Reader

ILLUSTRATION BY JULIA TALCOTT; PHOTOILLUSTRATION BY CANDACE KUSS





Channel machines. Many potential customers have shied away from the proprietary bus design, which is incompatible with peripheral or expansion cards built for earlier PCs.

But the argument began to break down in light of the 80386 and even faster microprocessors on the horizon and the taxing applications many users foresee for machines built around those processors. The stan-

dard AT bus is too slow and too limited to fully exploit those processors, while the Micro Channel was designed with them in mind.

Having chosen not to follow IBM's Micro Channel direction, the defenders of the "industry standard" had little choice but to make all sorts of proprietary extensions to the standard in order to support 32-bit memory, high-speed data

transfers, and multiple processors in 80386-based machines. As a result, the 80386 market today has almost as many "standards" as it has manufacturers—a nasty, confusing situation for both makers and buyers.

The EISA specification is an attempt on the part of nine of the largest PC compatible manufacturers (AST Research, Compaq, Epson, Hewlett-Packard, NEC, Olivetti, Tandy, Wyse, and Zenith) to end that confusion by promulgating a new industry standard for 32-bit 80386-based PCs. The new specification, its proponents say, provides performance comparable or superior to that of the Micro Channel in such key areas as memory capacity, support for multiple processors, 32-bit data transfers, and direct

memory access (DMA) transfers, while maintaining backward compatibility with standard 8-bit and 16-bit peripherals. EISA also includes support for other Micro Channel features, such as automatic configuration of expansion cards.

According to its sponsors and the many other software and hardware vendors who have announced that they will support the new specification, EISA is an extension of the existing AT bus designed to support the high performance requirements of 80386-based PCs, not a new bus design. Thus, they say, it remains compatible with older PCs while providing the same advanced features that are offered by the Micro Channel architecture.

All of this, of course, remains to be seen. The first 80386-based machines using EISA aren't expected to be released until the fall of 1989.

—Paul Bonner

was tested at Price Waterhouse, where users of the audio feedback more than tripled their data input productivity, according to Marq president and CEO Dale Sundby.

Because the MarqSystem is modular, you can add to it as your data-input needs change or expand. The base unit, which includes the mouse and control software, sells for \$199. The scanner module, which comes with

a full-sized expansion card, a bus converter for the mouse, an optics cartridge, and software, is \$799 and will be available early next year. The MarqReader upgrade, priced at \$1,299, includes the optics cartridge, audio module, headphones and earplug, and software. It, too, will be ready in the first quarter of 1989.

For further information, call the San Diego-based company at 800-336-8366.

—Chris Shipley

## MarqNavigator Gets Around 1-2-3

It started out as companion software for the MarqSystem, but it made it to market sooner and of its own accord.

Marq Technologies' MarqNavigator is a graphical interface to Lotus 1-2-3 that lets you maneuver through a worksheet and execute commands without touching the keyboard. In fact, says Marq president Dale Sundby, you can use MarqNavigator and a Microsoft- or Logitech-compatible mouse to do everything but actual data entry in 1-2-3.

MarqNavigator brings this ease of operation to 1-2-3 in a series of drop-down menus from which you can select and execute commands. You can also drag or push the worksheet around the screen, pull open and move worksheet windows, change column widths, and define ranges by pointing.

The program adds 35KB to 1-2-3's overhead and runs with both Release 2 and 2.01. The \$149 package is available directly from Marq Technologies, in San Diego, at 619-452-2373.

—Chris Shipley

**The Marq-System builds scanning and image recognition into a mouse.**





# IBM Goes Back to Basics

**M**aybe the AT wasn't such a bad computer after all.

That's the message IBM seemed to be sending when it introduced the AT-compatible PS/2 Model 30 286, an enhanced Model 30 with a faster processor, better graphics, and a modified AT bus. But whatever you do, don't call it an AT.

"We have not gone back to the AT. This is not an AT. It's not even the same speed," IBM spokesperson Linda Dezan says emphati-

cally. "To say it's an AT is very misleading because there is nothing about it that's an AT, including the bus."

But by introducing a computer that is compatible with a standard it had abandoned over a year and a half ago, is IBM saying anything about its commitment to, or the sales of, its Micro Channel machines? John Jones, an analyst who

follows IBM for Montgomery Securities, doesn't think so, and neither does IBM, which reports that, out of the 3 million PS/2s sold, over half use the Micro Channel architecture.

"We're getting the nod of approval from our customers by the number of PS/2s they are buying. Three million tells us a lot," says IBM's Dezan.

Not everyone shares this view. "I think users are starting to lose confidence

that IBM has a vision of the future," says Brian Camenker, executive director of the IBM PC Group of the Boston Computer Society. "It was trying to put forth this magic Micro Channel architecture with no discernible reason why people should use it, and now it's facing the fact that many people do not consider the PS/2 Micro Channel computer the way to go."

Montgomery's Jones believes that IBM understands what its vision and its direction are, but that it sees its competition producing a lot of revenue based on 286 machines with AT buses and wants a piece of the action.

With the Model 30 286, IBM reenters the fastest-growing segment of the PC arena. "I think [IBM] misjudged the demand in the low end of the product line," says Jones. "It also misjudged how much demand was in the marketplace for AT compatibles."

The Model 30 286, Jones says, is a replacement for the PC AT that IBM has continued to sell in Europe. "[IBM] needed to produce an AT-compatible product that had better gross margins. And the U.S. market was telling it that there was enough demand to warrant introducing the product here."

"All we did," says Dezan, "is take one of our best-selling machines and make it better."

Whatever the reasons behind the introduction of the new Model 30, Camenker says, "The smart people are going to wait six months after it's been out before they even consider buying hardware from IBM—or just about anybody else, for that matter." —Kenan Woods

ILLUSTRATION BY JULIA TALCOTT



## Chill Out

Heat destroys microprocessors, but Scitech's got a device that will help your chips keep their cool.

Scitech's Cool Chip is the answer to a study in the March 1986 edition of *Mechanical Engineering* magazine, which found that reliability is cut in half for every 20-degree increase in chip temperature.

Cool Chip is a "finned aluminum extrusion," or heat sink, that mounts directly on a processor and/or coprocessor to cool the chip. A heat sink

works by increasing the surface area of a chip that is exposed to the airflow inside the computer. Cool Chip increases surface area by more than 600 percent, cooling the processor as much as 30 degrees and doubling the chip's life span, according to Scitech's specifications.

Heat sink technology has been used in super- and mini-computers for some time, but Scitech president Adam Fadhli says Cool Chip is the only device of its kind for PCs.

PC makers, however, say they don't use heat sinks in their designs because they don't need them. "One of the considerations we take into ac-

count when designing a computer is to ensure adequate airflow and fan capacity," a Compaq spokesman said. "Our computers have no heat problems."

Fadhli agrees there is no immediate need for heat sinks in PCs because a processor can last quite a few years without one. But, he adds, "Everyone knows what heat can do to a processor. What we're trying to do is get that heat down and make everything last longer."

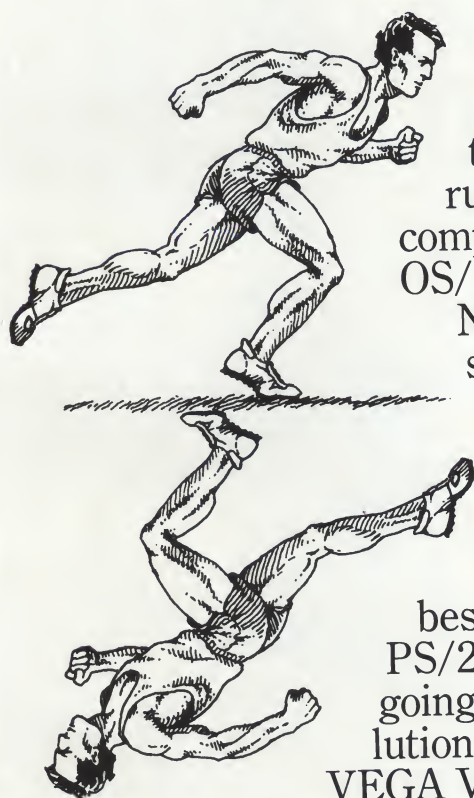
John Oxaal of the Weitek Corporation, which until recently sold a coprocessor board using heat sinks, says most of the top computer makers take good care that their chips won't overheat, but people who buy clones that use second-rate processors could need a product like Cool Chip.

The product comes in two versions: one for 8088, 8087, 8086, 80287, and V-20 chips and one for 80286, 80386, and 80387 chips. They are \$5 and \$10, respectively. Scitech, of Groves, Texas, can be reached at 409-962-3176.

—Kenan Woods



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CIRCLE NO. 186 ON READER SERVICE CARD.



# XyQuest Adds Menus to XyWrite

**X**yQuest, Inc., has added optional menus to its XyWrite word processing software, making the normally command-driven program accessible even to computer-phobes.

By adding a menuing interface to XyWrite III Plus that is designed to appeal to less experienced or less motivated users, XyQuest hopes to break out of the publishing niche, where it is most popular, and into corporate markets.

The menuing software, called A La Carte, uses an adaptation of the help menus in past XyWrite versions, rather than typical pull-down menus. Hit F6, and a list of choices appears across the top of the screen. Move the cursor or mouse to highlight an option, and a line of text appears, listing suboptions for the item.

Executing a command from the menu is easy: highlight your choice and click the mouse, hit Enter, or type the uppercase letter in the command. Using the menus does slow you down, but new users can bypass them once they are familiar with commands. In fact, XyWrite pros don't even have to load A La Carte.

You still activate help by hitting the Alt-F9 combination, but with A La Carte, XyQuest has introduced context-sensitive help. Rather than paging through a dense XyWrite help screen, the new system helps you with the command you are currently using.

Users of earlier XyWrite

versions may upgrade to the menus for \$30. The inclusion of A La Carte in XyWrite III Plus will not

word. The network version adds group redlining, bookmark, and central control features.

## A La Carte menus make cryptic XyWrite friendly.

The network twist to redlining is that, if you move your cursor onto a comment area, the command line will show the name of the person who made the change, and the date and time it was made. You can also see where everyone made changes, with their names in front of their comments.



increase the \$445 list price.

XyQuest has also rolled out a network version of XyWrite that has a few added features, but its only real difference is the startup procedure, in which you must log in with a pass-

## Where No PC Has Gone Before

With help from a few forward-thinking computer manufacturers, inventors can now add brains to just about any gadget by popping in a fully capable PC that's hardly bigger than a credit card.

Take, for example, the Intel Corporation's Wildcard 88, a 2-by-4-inch marvel of miniaturization that costs about \$50 wholesale. Intel, maker of the chips that give IBM-compatible microcomputers their thinking power, squeezed an 8088 microprocessor, an all-in-one support chip, and a socket for a ROM basic input/output system (BIOS) chip onto the tiny Wildcard board. Add the ROM, some memory, a keyboard, a monitor, and a disk drive, and the Wildcard can run DOS programs as capably as any full-sized desktop machine.

Although you could build a fully functional PC from Wildcard or one of its ilk, you won't see many hooked up to EGA monitors or full-size keyboards. Instead, they'll replace custom-designed circuits as the unseen intellect within special-purpose test equipment, industrial controllers, and telecommunications devices. Eventually, they may turn up in pricier consumer products—digital television sets, home security systems, and stock market quote machines.

Designing a miniature PC into a new invention makes it possible to use an ordinary

DOS computer to write software, taking advantage of the host of compilers, debuggers, and other tools that make PC programming easier.

In addition to Intel's Wildcard, a PC-on-a-card loaded with BIOS ROM should be available by year's end from Western Digital, an Irvine, California, chip design house.

For designs that do require PC peripherals, there are the PC- and AT-compatible Little Board computers sold by Ampro Computers, of Sunnyvale, California. A Little Board comes with disk drive, video circuits, RAM, keyboard, printer, and serial ports, all on a 1-inch-tall board that fits exactly on top of a 5¼-inch disk drive.

—Steve Cummings

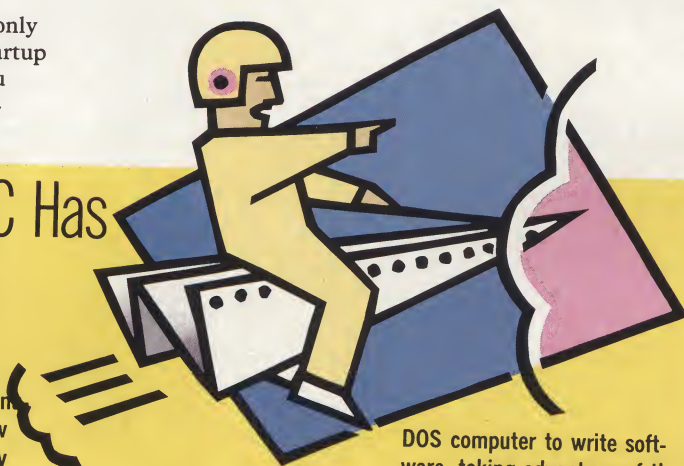


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CIRCLE NO. 261 ON READER SERVICE CARD.



# Toshiba Trots Out Laptop Line

The lithe brunette strutted down the runway at the Terrace Room in New York's chic Plaza Hotel, a Toshiba T5200 laptop slung jauntily over her shoulder. Her dapper male counterpart toted the new T1600. No ordinary fall fashion show, this: it was Toshiba America's introduction of its top-of-the-line products.

The show's most zaftig model was the T5200, Toshiba's most powerful 386-based laptop yet. Weighing a hefty 18.7 pounds, the T5200 runs at 20MHz and includes a high-speed static RAM cache and an 82385 cache controller, a socket for an 80387-20 coprocessor, a full-length 16-bit slot, and a high resolution VGA display. The machine is also brainy, with 2MB of RAM (expandable to 8MB), a standard diskette drive, and a 40MB or 100MB hard disk. Unfortunately, the

T5200 still requires an AC outlet. And just how fashionable is lugging around a portly, exorbitantly priced (\$9,499 for the 40MB-drive version, \$10,999 for the 100MB drive) computer?

More modestly alluring is the T1600, an 80C286-based battery-powered laptop computer. This trim (11.6 pounds) 12MHz machine is adorned with 1MB of memory (expandable to 5MB), a 20MB hard disk, a coprocessor socket, an EGA display system with color monitor port, rechargeable batteries, and a supertwist LCD screen. Priced at \$4,999, the T1600 is less powerful than the T5200, but you don't need to be a weight lifter to carry it.



**Toshiba's T1600 (left) and the ExpressWriter301 portable printer.**

Toshiba's most provocative model was the ExpressWriter301, a portable, 24-dot letter-quality printer. It weighs 4 pounds. With svelte dimensions (3 by 12.2 by 5.5 inches) and a nickel cadmium battery, its vogue among the laptop set seems assured. This \$489 machine has 2KB of memory and

five resident fonts, and it raps out 60 characters per second.

The new ExpressWriter311, a shapely 24-pin printer that produces 180 cps in draft mode, sports an ample 16KB buffer, a 16-by-12.7-inch footprint, and five resident fonts. It's a pricey \$589.

Toshiba America, of Irvine, California, can be reached at 800-457-7777.

—Marty Jerome

## Romance Online

She is CLARA ("I'm all caps"), Goddess of the TTY. He is duster ("lower case only"). Before one had ever heard of the other, each would go home alone after work and "download like crazy." Then, one sultry evening last summer, they met by chance on Aline, a network communication service imported from France. On Aline, you may carry on completely private videotext conversations with as many as 10 people, on as many subjects.

The Goddess, 34, a telecommunications manager for a large law firm, likens chatting on Aline to playing multilevel chess on Star Trek. She talks to men—"but only the clever, the witty, the humorous." When duster, a 28-year-old online researcher, logged on, "it was immediate magnetism. How do you know? You just know. It's a gut feeling. You really establish a persona online. For example, one-liners are my forte. He threw them back. Fast. Yes, almost immediately, I fell in love with him." With mounting passion, they flirted on Aline for a week, then



switched to voice—the telephone ("We talked all night!"). Six weeks later, duster moved across town; he and the Goddess are now ecstatically ensconced in her New York apartment.

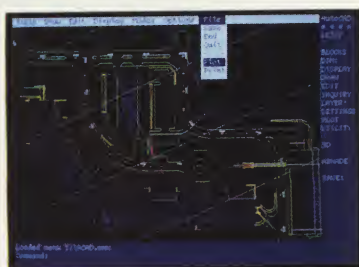
Roseanne, a divorced mother of five, and Joe, a bachelor and retired computer consultant, both shy, both in their late 40s, and both from Yonkers, met one dark moonlit night on the Executive Network. Their love ripened more slowly; eight months passed before they were married online in a Group Chat ceremony with 14 friends logged on as witnesses.

People usually log on at night, say the network operators, but now they're beginning to flirt online all day—executives, legal secretaries, word processors, and programmers. Owned by Newcom Link, Aline is up nationally on Infonet and is going international. You can reach Aline online in New York at 540-5465 from most prefixes, or call 212-832-8311 for instructions. The Executive Network has about 7,000 users per month, mostly professionals. Join the online fun (at 1,200 or 2,400 bps) by calling 914-667-4567.

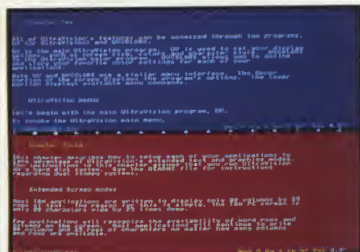
—Susan Alexander

ILLUSTRATION BY JULIA TALCOTT; PHOTOILLUSTRATION BY CANDACE KLUSS

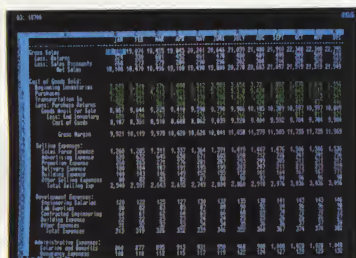




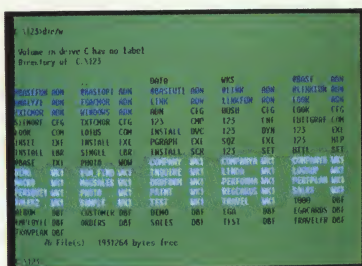
Get VGA graphics resolution on any EGA with autosync monitor for AutoCAD, Windows and Ventura Publisher.



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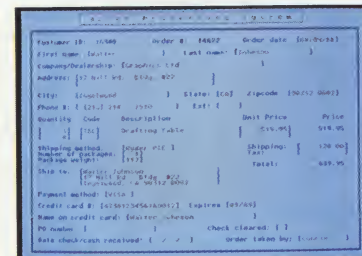
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See more on the screen when you write code or review program listings in editors like Brief, 120 x 43 shown.



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EGA display with UltraVision.

These unretouched photos demonstrate how UltraVision improves character resolution on any EGA with autosync monitor. Normal EGA characters are defined in an 8 x 14 matrix versus 9 x 19 for UltraVision.



**A**fter making its mark in the top-of-the-line modem market, the Telebit Corporation is moving its patented modem protocol down the line. The Mountain View, California-based company has applied the technology it uses in its TrailBlazer Plus and T2000 19.2-kilobit-per-second modems to its new multispeed T1000.

Operating at speeds from 300 to 9,600 bits per second, the T1000 automatically adjusts to the operating speeds of the modem to which it connects. When moving data at speeds of 2,400 bps or below, the modem uses the MNP Class 4 error-correction protocol. At 9,600 bps it uses Telebit's proprietary PEP protocol, which organizes data into independent channels, then determines the maximum amount of data that can be sent error-free over each channel at one time.



## Telebit Moves Modem Protocol On Down the Line

Telebit is aiming the T1000 at "unsophisticated business users" with a range of communications requirements: from those who log into bulletin board systems that operate at various transmission rates, to those who may one day require fast 9,600-bps data transfer. The T1000 is also Telebit's attempt to catch the swelling wave in the dial-up, er-

ror-correcting 2,400-bps modem market. By pricing the T1000 in the range of 2,400-bps error-correcting modems, says Telebit senior vice president Donald Heitt, the company hopes to attract buyers looking for 2,400-bps devices by giving them the bonus of 9,600-bps operation.

At \$795, the T1000 competes in price with Hayes Microcomputer Products' V-Series Smartmodem

**The T1000 brings Telebit's protocols to the mass market.**

2400, which sells for \$849 and \$899 for the internal and external models, respectively. But if your needs top out at 2,400, you'll find 2,400-bps error-correcting modems for as little as \$200.

Telebit, of course, offers room to grow, and that's the appeal. And when compared with other 9,600-bps modems, the T1000 isn't a bad deal. Moving up to the 9,600-bps Hayes Smartmodem, for example, will cost a minimum of \$1,199, although some 9,600-bps devices hover in Telebit's price range.

Still, if you're in the market for a 2,400-bps modem, yet you fear technological obsolescence, you might want to give Telebit a call at 800-835-3248, or 415-969-3800 in California.

—Chris Shipley

## TrueScan: Getting the Recognition We Deserve

**S**canners really haven't lived up to their advanced billing. The fundamental problem is they just can't read everything that's fed into them. But Calera Recognition Systems is out to change that with TrueScan, a plug-in scanner recognition card for ATs and compatibles.

Calera president Stephen

Dow describes TrueScan as essentially a printer in reverse. "Just as a printer can take information from your PC and put it onto a page, TrueScan can take information from a page and put it directly into your PC," Dow claims.

TrueScan's software is straightforward: choose

from the menu the format (image or text) in which you want the page to be delivered, then scan. The board recognizes the typeface and converts it into binary code, while the software formats the information for use in just about any program. Most word processing, desktop publishing, graphics, spreadsheet, and database file formats are supported by TrueScan.

Recognition products like TrueScan and the Caere Corporation's OmniPage are giving desktop computers text-recognition capabilities that were, until recently, available only in systems costing as much as \$30,000.

"Both Calera and Caere have introduced a new set of functionality that did not exist before, at any price point," says Stewart Alsop, publisher of *P.C. Letter*.

Still, this kind of functionality doesn't come cheap: the TrueScan sells for \$2,495 for a 2MB version and \$3,495 for a 4MB card. But Alsop doesn't believe price will be a major consideration for buyers. "I don't think it's a matter of price. I think it's a matter of whether it does what they want it to do."

Calera (formerly the Palantir Corporation), in Santa Clara, California, can be reached at 408-986-8006.

—Kenan Woods

**TrueScan brings intelligence to text and image scanning.**



PHOTOILLUSTRATION BY CANDACE KLUSS





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# PFS:First Graphics—A Stripped-Down Harvard

**A** learner's paradise and a dilettante's dream. That's PFS:First Graphics, a bare-bones but affordable graphics program from the Software Publishing Corporation (SPC).

First Graphics is really a subset of SPC's best-selling Harvard Graphics program. And while SPC merely snipped at Harvard's functionality, it slashed the \$495 price to \$149.

First Graphics' menu selections are nearly identical to Harvard's—there just aren't as many of them. The approach to chart creation is entirely menu driven, with almost nowhere to go wrong. You select the type of graphic you wish to create from a main menu and are led through a series of submenus that design your chart.

For example, you can opt to create a pie chart, enter your data into a fill-in-the-form template, and then fine-tune your creation by labeling slices, specifying 3-D effects, exploding slices, linking a slice of one pie with another pie or column chart, or sorting your slices in size order.

First Graphics offers a somewhat mundane but comprehensive assortment of chart forms: free-form text, bulleted lists, and bar, line, area, high-low-close-open, and pie charts. The program offers five built-in fonts (although you are blessedly prohibited from mixing them in a chart), a large selection of type sizes, and an assortment of simple but effective borders, bullets, grid lines, and legend effects. You can add bold-face, underline, or italics, or change the color of individual words, characters, or lines of text.

Most importantly, the package includes the same hearty data import facilities as Harvard. You can import 1-2-3 data, 1-2-3 graphs, and ASCII files and export to Harvard Graphics and PFS:Professional Write. Like Harvard, First Graphics can create onscreen slide shows. However, you can't specify time intervals or spectacular fades from chart to chart, as you can with Harvard. Note-making capabilities are also missing from First Graphics.

Of course, the list of what you cannot do with First Graphics is just as long as what you can do. Noticeably absent from the package are the bells and whistles that let you personalize a graphic. There's no freehand drawing capability, no way to manipulate graphics elements onscreen, no way to add built-in primitives (lines, circles, or

polygons) or built-in symbols (clip art).

Nor does First Graphics provide film recorder support; if you want to make slide presentations, this isn't your package. Furthermore, because it doesn't export graphics metafiles or Encapsulated PostScript files, its use as a source of graphics for desktop publishing is limited.

Before you buy, you'll need to do some soul-searching and decide whether you fall into the dilettante or aspiring power user category. While First Graphics serves as a great prep school for Harvard, motivated folks may want to skip the prep and jump into full-fledged graphics creation. SPC, in Mountain View, California, can be reached at 415-962-8910.

—Robin Raskin

## To Your Health

Is a PC good for your health? It just might be, in the case of CD InfoMachines, coin-operated CD-ROM systems for public use.

Introduced this summer by Custom Design Technology of San Jose, California, each multiuser system combines medical and health databases on CD-ROM with a PC and printer. CD InfoMachines will accept nickels, dimes, or quarters. Later, the systems will also accept credit cards and debit cards.

William Liu, owner of Custom Design, says the company has placed five pilot CD InfoMachines in university libraries across the country and plans to install more at such sites as drugstores, bookstores, supermarkets, hotels, and airports.

People can use the systems to answer questions about drug prescriptions, nutrition, and health-related issues. You can key in your personal demographics and get health advice to match your profile; you can even get a nutritional breakdown of your favorite foods.

The complexities and dangers of certain drug combinations have become increasingly difficult for pharmacists and doctors to track. The system, with its database of 3,000 common prescription drugs, has already saved several lives in Florida, Liu says, by alerting users to contraindicated prescriptions.

CD Technology expects to place several thousand CD InfoMachines within five years, Liu says. The company is even working on a financial and corporate-information CD-ROM database, drawn from more than a dozen online databases and oriented toward consumers.

—Patricia Mandell



ILLUSTRATION BY JULIA TALCOTT



# THE BUS STOPS HERE!

## CompuStar: PS/2 and PC/AT Compatibility.

Ask any computer expert about what type of system you should buy nowadays and you'll likely get a "pass the bus" response. Something like — "Well, uh, the PC/AT\* bus is your best buy but, then again, the new PS/2\* bus may become the next industry standard." Great advice, right? If trying to decide on a microprocessor weren't tough enough, now you're expected to pick a bus, too.

### RELAX, NOW THERE'S COMPUSTAR®.

The all new CompuStar from Wells American not only lets you interchange microprocessors, you can also mix and match buses — a PC/AT bus, a PS/2 bus or... both. As your computing needs change, simply snap in a new processor or add an extra bus. You'll never again have to worry about buying the *wrong* computer system!

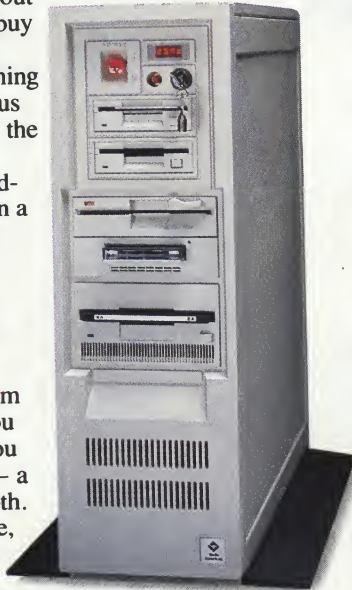
### FOUR COMPLETE SYSTEMS IN ONE.

The CompuStar can be configured with any of four microprocessors — an 8086, an 80286, an 80386SX, or an 80386. The processor and up to 16 megabytes of user memory have all been combined, using the latest VLSI technology, on a single, plug-in CPU module. Plus, any time during the first year of ownership, CompuStar users can "trade-in" the CPU module they initially selected toward the purchase of any of the other more powerful modules. *Nobody* but Wells American gives you this kind of value.

### A CONVERTIBLE BUS? YOU'RE KIDDING!

No, we're not. In fact, it may well be the most practical microcomputer innovation ever. Say you've selected an AT compatible CompuStar and later want to add PS/2 compatibility. No problem! Snap in a PS/2 Bus and Adapter Module and you can use *both* buses in the same system. Likewise, if you've selected a PS/2 compatible CompuStar and decide you want to add an AT bus, just snap in an AT Bus Module. Depending on configuration, the CompuStar can have up to 13 bus expansion slots — all AT slots, all PS/2 slots or a "split-bus" of AT and PS/2 slots. No matter which bus becomes the

next industry "standard," you'll have peace of mind knowing your investment in a CompuStar will be protected.



The CompuStar is also easily expanded. That's because there are seven CompuStar disk/tape compartments — six accessible from the front and an additional full-height bay inside. All this in a sleek, compact tower design that will leave *more* room on your desktop than any of the so-called "desktop" models.

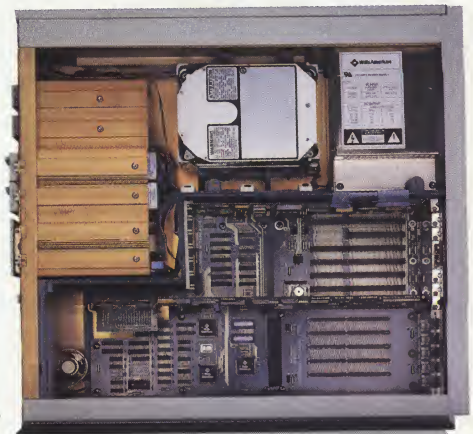
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The CompuStar® Multi-Processor, Convertible Bus™ Microcomputer. It's no surprise that our engineers invented it. After all, we've been making microcomputers longer than anyone else... even longer than IBM! And if that kind of experience doesn't impress you, CompuStar's service programs surely will. You can select an optional overnight module swap-out plan or on-site service from General Electric Corporation — one of the most respected names in consumer electronics. And, of course, every CompuStar carries a full one-year factory warranty.

### FINALLY, AFFORDABLE TECHNOLOGY.

Think all this technology sounds expensive? It's not. CompuStar 20MHz 80286 systems start as low as \$1995†. There are also inexpensive 8086 and powerhouse 25MHz 80386 systems available. Plus,

there is a wide variety of CompuStar display, tape and disk options including a one gigabyte erasable optical disk. You can choose a factory pre-configured CompuStar or custom design one yourself. Just unlock the front panel and literally "snap-in" a bus, CPU, memory or disk module in a matter of seconds. It's system flexibility never before available... at any price.



While one of our competitors (we won't mention any names) threatens you with "missing the bus," most simply *pass* the bus. Our new CompuStar, however, *eliminates* the bus problem altogether. Not to mention the processor problem. Even the expansion problem. Prove it to yourself. Call today about our 31-day trial offer. Oh, and by the way, the next time anyone asks, tell 'em you know where the bus stops.



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\*Personal Computer AT, AT and PS/2 are trademarks of International Business Machines Corporation. †Photographs depict optional equipment. A complete price list is available upon request. CompuStar 80286 system (\$1995) includes an AT Bus Module, built-in VGA/EGA display adapter, one diskette drive with controller, two serial/one parallel/one mouse port, keyboard and 220 watt power supply.

CIRCLE NO. 268 ON READER SERVICE CARD.



## Performance Plus: Behind the Times

Mention Texas Instruments and most people think of chips or calculators, but TI also writes software, including a desktop organizer, Performance Plus.

Like Borland's SideKick Plus, Performance Plus is loaded with handy tools, including a calculator, appointment calendar, and file and disk managers. And it has some unusual features; it can display a clock over a text-based application, blank the screen, or display an ASCII table. But the user interface of Performance Plus is behind the times, and commands are not consistent from module to module.

The 13 modules can each run from the DOS command line, or can be loaded into memory and run as terminate-and-stay-resident (TSR) applications. To conserve memory, you can load only the modules you need.

TI supplies a program called DeskTop that ties everything together. DeskTop provides a character-based graphical representation of the Performance Plus modules and allows you to

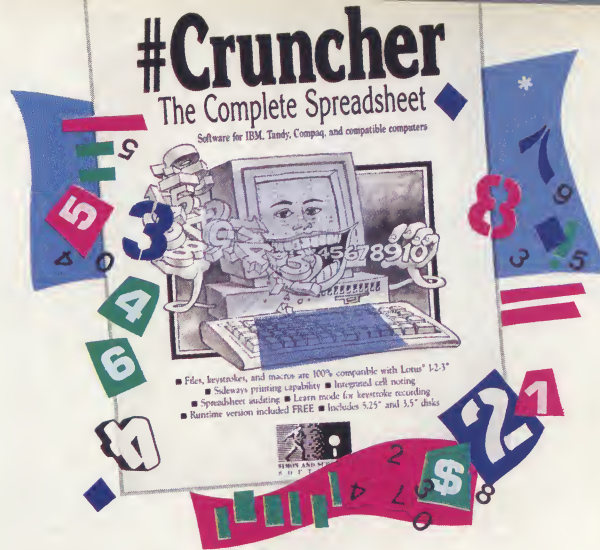
link 11 of your own programs for quick access from DeskTop.

Programmers will appreciate the pop-up scan-code table, which allows you to obtain the scan code, the ASCII equivalent, and the combination codes (with Shift, Alt, and Ctrl) for each key. The editor logs all keystrokes during an editing session so that a power outage won't result in a lost or damaged file.

However, Performance Plus offers only a single, limited calculator, no outliner, and no communications program. And you can't just sit down and start using the advanced features. The online help system does compensate for the non-intuitive command sequences, but the command inconsistencies are inexcusable.

For \$129, Performance Plus offers a useful, if not outstanding, collection of desktop accessories but packages them in a two-year-old user interface. There are worse programs on the market, but there are better. TI's Data Systems Group, in Austin, Texas, can be reached at 800-TI-PARTS.

—Jeff Holtzer



## #Cruncher Does the Trick for Home or School

When Simon & Schuster's #Cruncher showed up, we had to ask: Why do we need another Lotus 1-2-3 look-alike?

#Cruncher meets the standards of 1-2-3 compatibility: it reads and writes WKS/WK1 files, runs 1-2-3 macros, and uses the 1-2-3-like command and menu structures.

But why buy #Cruncher? For starters, the price is right: \$99.95, versus \$495 for 1-2-3. Second,

#Cruncher offers functionality that you won't see in 1-2-3 until Release 3 hits the streets, including sideways printing directly from the print menu and new @Is functions, such as @Is-time and @Isdate.

But the most impressive differences are in the RangeOps command (#Cruncher's answer to 1-2-3's Range command). A cell noter attaches notes to any cell, complete with editing and display options. The Labels command saves keystrokes by creating rows or

## It's About Time Missing a Few Beats

Pyramid Software Publishing has taken the traditional appointment scheduler, phone directory, and notepad of desktop organizers, embellished them with such features as mail-merge and expense reporting, and maintained a modest price (\$59.95).

The package, called It's About Time, has an appointment calendar with most of the basic features. But if you've got an expense account to keep, you

can append various expenses to each item on your agenda. A printed report itemizes and totals items. There's also a screen that lets you put together priori-

tized to-do lists for each day.

The phone directory lets you store names, addresses, and phone numbers and search the list by name, company, or category. You can also enter reminders to call associates on specific dates. At your request, the program will obligingly list the names and numbers of people who should hear from you on any given day.

The simple text-editing module lets you create form letters easily. A menu presents the field names in your phone directory database, which you can insert as mail-merge fields in your letter. Call up the phone directory and select the recipients of your letter. Then sit back as the program prints the letters.

Unfortunately, It's About Time comes up short in some ways. It lacks the elegant design that makes us-



PHOTOILLUSTRATION BY CANDACE KUSS; ILLUSTRATION BY JULIA TALCOTT



columns of standard labels such as days, months, and quarters.

Other #Cruncher pluses include spreadsheet auditing, a learn mode for macro creation, and a runtime version. Auditing handles circular references, errors, and zero values. The runtime version lets you create worksheet models that can be distributed to others.

But #Cruncher has its drawbacks, too. #Cruncher handles worksheets up to only 256 rows by 8,042 columns, not nearly big enough for heavy hitters. The manual is only adequate. The quick reference guide is merely an index for the manual, and the tutorial lacks substance and direction.

If you want real power, you should probably stick with Lotus. But if you need a spreadsheet for school-work or home use, #Cruncher will do the trick without bruising your pocketbook. Simon & Schuster, based in New York, can be reached at 800-624-0023 (800-624-0024 in New Jersey). —Mike Burgard

ing some packages of this type almost as easy as putting pen to paper. And though it will run as a TSR that you can pop up from within another program, it must first strip off some important features and gobble up a whopping 190KB of RAM.

Contact Pyramid Software Publishing, of El Toro, California, at 714-583-1060.

—Robert Kendall

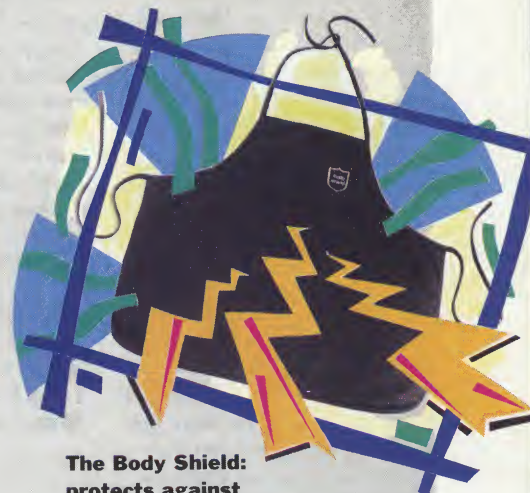
## Careful What You Ask For

Only an issue ago, with tongue firmly planted in cheek, we asked for an apron that might protect PC users from the horrors of ambient radiation. No sooner had we put the issue to bed than we discovered the Body Shield.

The lightweight (less than a pound), colorful (navy, brown, maroon, or black) apron affords the same radiation protection as a quarter-inch-thick aluminum panel, says its maker, RamStar Group of Miami. The Body Shield reduces the risks of radiation in the 10Hz-to-10GHz range, says Tomas Rodriguez, chief chemist for RamStar Group. While he wouldn't reveal the material from which the apron is made (that's proprietary information), Rodriguez says the Body Shield has been tested by three independent laboratories.

The Body Shield sells for \$29.95 directly from RamStar Group; call 800-327-2303.

—Kenan Woods



**The Body Shield:** protects against harmful rays.

## Graph-Mania, Flash-In: A Mix of Features, Fluff

To the endless stream of add-in products for Lotus 1-2-3, PC Publishing adds two more: Graph-Mania and Flash-In. Priced at \$99.95 each, they are a mixed bag of good features and a little fluff.

Both products use Lotus's Add-in Manager. If you're familiar with the Add-in Manager, you can install the programs with a couple of copy commands. If not, an installation program steps you through.

Graph-Mania, which requires either an EGA or VGA graphics card, can create some graphics, but its most impressive feature fits more cells on a screen by compressing the characters. From the menu, you may customize display area size, or select one of four options ranging from a standard 80 characters across by 25 lines to 160 characters by 58 lines. Although us-

ing the smallest screen is like reading the copyright notice on an eye chart, the dense display makes it easier to move through the spreadsheet.

The package also lets you create a pop-up graphics window that replaces 1-2-3's Graph View facility. The feature's not a thriller, but it does create a view of the current graph in a window over your spreadsheet, and you can see the graph change as you reenter data.

Flash-In brings five tools to 1-2-3, the best of which is the Look function. With Look, you can open a second spreadsheet and display it in a smaller window on your screen. A little like 1-2-3's File Combine option, Look helps you see what's inside one worksheet before you bring its data into another.

The remaining tools are helpful but not exciting. To help you view the structure of

your worksheet, the Zoom command displays the entire worksheet on one screen, showing full cells as reverse video squares. Select a range name and Zoom will show that range's position.

Disk-Find searches stored worksheets for a label, range name, or filename. Using it requires a little care, though, because there's no stopping the search once it starts.

Flash-In's Search function checks the current worksheet for labels, numbers, or formulas. You can specify exact or partial matches, control the comparison of case, and round numbers for a closer match. The Replace function adds to Search, replacing the contents of one or several cells with new information.

Most users want an add-in that makes a dramatic impact on the way they use 1-2-3. PC Publishing (which can be reached at 800-634-4555) has made a few tasks easier with Graph-Mania and Flash-In, but in the end neither one is earth-shattering.

—Mike Falkner



# File Organizer Does Windows Better

**W**hen you get right down to it, Microsoft Windows doesn't really provide Macintosh-like ease of use. And without powerful ways to accomplish such everyday tasks as copying, moving, and backing up files, Windows has little to offer advanced users.

Publishing Technologies recognized Windows' shortcomings and has made strides toward a solution with its File Organizer, an extension of both DOS and Windows. The package provides a simulated desktop that uses graphic symbols, or icons, to accomplish file organization and management. The version we reviewed (2.03) has some bugs and quirks, but it also has enormous potential.

File Organizer can be used instead of the MS-DOS Executive. The program displays several icons that correspond to your PC's disk drives, printers, and so on. To "open" a disk drive, you double-click on it with the mouse (keyboard-only equivalents are available for most commands). A window then opens, showing each file and folder (equivalent to a DOS subdirectory) on that disk as an icon with a title.

To open a folder (that is, to change the directory), double-click on it and another window opens, listing the contents of that folder. To run a program, double-click on it. Multiple windows can appear onscreen simultaneously. Copying a file from one folder to another is as simple as pointing to it with the mouse and then dragging it to another window or desktop icon. You can copy, move, delete, and back up folders and disks in a similar man-

ner. Changing the name of a disk, folder, or file is as simple as clicking on the title line and typing in the new name. The program also includes a built-in text editor.

While File Organizer improves the Windows environment, it does have its own problems. First, it has trouble managing memory. On a 386-based Dell System 300 with 3MB of memory running Windows/386, I had trouble using PageMaker and WordStar 5.0 si-

multaneously. The program currently is unable to use expanded memory, severely limiting its ability to run large applications.

Second, the software is unstable; sometimes windows are not updated correctly, and the program crashed under a variety of circumstances.

Finally, the documentation and online help were produced carelessly.

In spite of its faults, though, File Organizer has potential and we hope that Publishing Technologies

works out the bugs. If so, this program could do a lot to promote use of graphical environments on PCs.

File Organizer—priced at \$145 alone, \$195 if bundled with Windows or a Logitech mouse, or \$245 with both—runs on any IBM or compatible PC and on IBM's PS/2 machines. It requires DOS 3.0 or later, and Microsoft Windows 2.03 or later. Publishing Technologies, of Austin, Texas, can be reached at 800-PUB-TECH.

—Jeff Holtzer

## Saving Face

Chris Fulmer was only 18 months old when his mother kidnapped him from his father. But thanks to New York-based Face Software and NBC television, Chris was returned to his dad three-and-a-half years later.

Face Software used its ImAger aging program and a photo of Chris at six months to create an approximated picture of him at age five. The simulated photo, broadcast on NBC, was recognized by viewers who had seen the boy. Chris is one of three children found after such photos were televised.

The \$25,000 black-and-white ImAger system works with photographs that have been digitized by a video camera. The program uses the facial composition of the person in the digitized image to simulate the effects of aging.

Predicting how children will age requires special techniques. "Children's faces aren't fully formed until age 18," says Nancy Burson, cofounder of Face Software. "Facial changes in adults are much easier to predict."

ImAger also takes into account the person's weight, says Burson. The skin on heavier people tends to sag, while thinner people become more gaunt as they grow older.

Though future versions of ImAger may be fully automatic, images created with the current version must be touched up. So far, Face Software's market has been the law enforcement field, particularly the FBI, but Burson says costs may drop enough to sell ImAger off the software shelf. For more information, contact Face Software at 212-226-2457.

—Christopher Johnston



**Chris Fulmer  
as rendered by  
ImAger (top), and  
after homecoming.**



# Tecmar's MicroRAM<sup>TM</sup> for the PS/2<sup>TM</sup> comes with up to 8MB of RAM, simple "5-keystroke" installation, OS/2<sup>TM</sup>, EMS 4.0, DOS and XENIX<sup>®</sup> compatibility, optional I/O ports, Models 50, 60 and 80 compatibility and— save \$200\* in change!

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Buy smart. Buy the best. Buy MicroRAM. And count your change. Call us now for more information at (800)624-8560.

\*Based on March 1988 price comparison between 0 Kb MicroRAM and Orchid Technology's RamQuest<sup>TM</sup> Extra.

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# Norton Commander: The DOS Shell for 1-2-3, dBASE Users

**T**he Norton Commander, by Peter Norton Computing, retooled in Version 2.0, hopes to elicit acceptance in a field crowded with DOS shells.

Innovative Lotus 1-2-3 and dBASE View utilities give the program its edge. When highlighting a WKS/WK1 or Symphony file, the View command displays the actual worksheet. With dBASE View, the first record of a dBASE file is displayed. Although you can't edit files in View mode, you can scroll through them, saving time when you need only a quick

check of a worksheet or data file.

Invoke The Norton Commander and up springs the current directory on a half-screen panel. You can display one panel by itself, or choose two if you want, say, a directory tree on the left and a file listing on the right. Standard options let you view and edit files, select files for copying, moving, or deleting, and change the sorted order or the level of detail of the directory.

A lower menu displays ten function keys while the upper menu uses drop-down windows to access the power of the program. Be-

cause you can access most commands from the windows, the replication of command structures is sometimes more confusing than convenient.

Don't expect to tear up the screen with The Norton Commander's editor; it lacks most functions you'd expect from a good editor such as insert, replace, and block functions and a split-screen capability.

The Norton Commander is quick and flexible, providing an excellent platform to supplement DOS. The



1-2-3 and dBASE viewers alone are worth the \$89 price, which is in the same range as other popular DOS shells. But if you don't use 1-2-3 or dBASE, then this is just another good DOS shell.

You can reach Peter Norton Computing in Santa Monica, California, at 213-319-2010. —Mike Burgard

## Beatles Revisited

It was 20 years ago that Al Brodax produced and coauthored the now legendary animated film, *Yellow Submarine*. Beatles lovers rejoice! Brodax is back, this time with a computer-animated sequel—the soon-to-be-released film *Strawberry Fields*.

*Strawberry Fields* will present bigger and better animation than ever seen before, the animation team promises. Conventional 2-D animation techniques are combined with computerized 3-D animation to provide frame after frame of fully rendered, digitized fantasy. The computer muscle power for the extravaganza is being supplied by the New York Institute of Technology's renowned Computer Graphics Laboratory. "NYIT's technology was the only way I could see to top *Yellow Submarine*," says Brodax.

*Strawberry Fields* heads skyward, as protagonists Jude and Michelle (with voices provided by top motion picture stars, although the producers aren't revealing identities) journey from Earth to the planet Rhyde (as in "Ticket to") and into the magical world of *Strawberry Fields*. The villainous Blue Meanies of *Yellow Submarine* have been re-

**A frame from  
*Strawberry Fields*.**



placed by an equally nasty Walrus and his henchmen, the Eggmen. The music, from the Beatles' *Sgt. Pepper* period, takes on new dimensions as performed by 1980s pop luminaries, including Michael Jackson, Cyndi Lauper, and Robert Palmer.

The frame shown here, which appears for only 1/24th of a second in the film, is a veritable how-to for computer graphics design. The animation depends on creating an electronic wireframe model, animating the model, and then rendering a fully colored, shaded, and textured frame. All the objects in the frame were created using NYIT's Computer Graphics Laboratory's proprietary software. The train is modeled from a series of carefully calculated spheres, cylinders, and free-form objects. The wireframe image is then manipulated from numerous vantage points to ensure proper perspective. Texture mapping, bump mapping, and alpha mapping, three techniques that overlay patterned surfaces on the image, give it depth and texture. The sky is created using stochastic noise modeling techniques to create a random effect. The smoke is achieved by sorting the scene's objects according to depth to create a

"matte" that diffuses the smoke through the image.

Put a few thousand frames like this one together, mix in a good dose of Beatles' music, add an epic plot, and you've got one helluva movie.—Robin Raskin

IMAGE FROM *STRAWBERRY FIELDS*, 1988 CGL, VESTRON AND ITC; ILLUSTRATION BY JULIA TALCOTT



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\*Prints on any of the following dot matrix graphics printers: IBM® Graphics or Proprinter, Epson (any model); Okidata 84, 92, 93, 182, 192, 193, 292; C. Ilob Prowriter; IDS 460, 560, and Prism; Dataproducts 8050; NEC 8023; Toshiba P321, P351. Does not require a graphics card. Requires IBM PC or compatible, DOS 2.0 or higher, and 128K RAM. Labels Unlimited is a trademark and Power Up! is a registered trademark of Channelmark Corporation. IBM is a registered trademark of IBM Corporation. Channelmark Corporation, 2929 Campus Dr., P.O. Box 7600, San Mateo, CA 94403 © 1988

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## Office to Go

The words "field office" take on new meaning when you see this 24-pound workstation from Secure Technologies.

The Portable Cellular Workstation boasts an IBM-compatible computer with 640KB of memory and a 20MB hard drive, an ink jet printer, a 2,400-bit-per-second Hayes-compatible cellular modem, and a phone—all housed in a polypropylene case with a built-in AC/DC power cell.

The battery powers the station for about five hours, depending on which components are used. The printer and telephone tend to be power hungry, so heavy use of the entire system could suck up all the power in as little as two hours, says vice president of



**The Portable Cellular Workstation: an office in a briefcase.**

marketing Ken Tighe.

The phone can be used for voice or data transmission, as long as you are within a cellular-supported area. The FCC has licensed over 300 metropolitan areas, of which about 250 are online now. The rest of the

country will be divided into areas that will come online sometime in the next couple of years. As a result, even though this portable workstation seems perfect for

use in remote areas, the system cannot yet be used to communicate in some out-of-the-way places.

The Omnilink International Corporation will sell the workstation as part of the systems and services it offers, says spokesman Dennis Wielech. For salespeople, real estate agents, and others who need access to a network from the field, the system will be a viable link.

The system costs \$9,850 but can be had for \$8,895 with two 3½-inch 720KB floppy drives and no hard disk. Secure Technologies offers a variety of options, including a 9-pound rechargeable battery pack.

Secure Technologies, in Herndon, Virginia, can be reached at 703-471-6338.

—Jane Hallisey

## Tell It to Dr. Shrink

"What do women want?" wondered Sigmund Freud, the father of modern psychotherapy. His binary descendant, Dr. Shrink, claims to have the answer for men and women alike.

A \$49.95 personality analysis program from San Mateo, California-based Neuralytic, Dr. Shrink develops profiles that probe for the inner fantasies of people you want to get to know.

Developed by Drs. Jim and Kathy Johnson, Dr. Shrink provides an X-ray test that lists personality traits such as "very social" or "calculating." Using the space bar, you decide to what degree the person exhibits that trait. Dr. Shrink then yields a written summary of the subject's personality, likes, and dislikes and even reveals his or her secret sexual fantasy.

The good doctor bases its analysis on a five-factor personality model. The adjectives used each fall under one of those five factors and were tested with the help of 200 subjects who rated each other's personalities.

In a good-natured way, the literature accompanying the package hypes Dr. Shrink beyond its capabilities. Dr. Shrink's claim to give "the power to X-ray a person's thoughts" is reminiscent of the X-ray specs sold in comic books. The Johnsons, however, claim that their software is used by trial lawyers, college professors, salespeople, and professional negotiators and "has even touched nerves inside the FBI and the CIA."

—Christopher Johnston

## Your Number's Up

In its Numbers Up memory-resident spreadsheet, MindScape has taken some of the pain out of cut-and-paste word processing, table generation, and quick calculations.

Numbers Up lets you work in your word processor, then pop up the spreadsheet. Call a Lotus 1-2-3 .wk1 or .wks file, create a quick worksheet, or develop a table. Then define a range, toggle back to the word processor, and paste the range into your document. Numbers Up does all the file format conversions automatically.

In fact, you can use this "intelligent" cut-and-paste feature to move data between any two text-based DOS applications. The cut command stores a duplicate of selected data in a cut buffer; the paste command transfers the data in the cut buffer into the target application. Numbers Up reformats the data on the fly.

The 64-column-by-999-row worksheet is 1-2-3

compatible, although it does not support about 75 1-2-3 @ functions. Numbers Up will read a 1-2-3 file that uses one of those functions, but will replace the formula with a cryptic message.

Numbers Up supports variable column and cell widths, letting you change the size of a single cell, a range of cells, or a portion of a column without affecting the entire row or column. Use this capability to generate forms or tables.

Be warned, however, that Numbers Up runs into trouble with a few programs (I couldn't get it to work with XyWrite III Plus, for example). But at \$79.95, Numbers Up is a neat little program (it only takes up 12KB when loaded) for anyone who needs quick access to simple spreadsheet capabilities. MindScape can be reached in Northbrook, Illinois, at 800-221-9884.

—Chris Shipley

PHOTOILLUSTRATION BY CANDACE KUSS



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# Crystal Makes Expert Systems Clear

**A**rtificial intelligence. Expert systems. The ideas are daunting to most PC users. Yet a development program called Crystal, from Intelligent Environments of Chelmsford, Massachusetts, puts expert systems within the grasp of most PC users.

An expert system is a computerized consultant: you supply facts, and it gives you conclusions based on those facts and a set of preprogrammed rules. Many companies use experimental and commercial expert systems for everything from medical diagnosis to oil well prospecting.

Expert system development tools, commonly called "shells," let you enter the rules and facts that control expert systems, much as language compilers let you develop traditional programs.

Crystal is an expert system shell that most developers can easily learn. If you understand programming language if-then statements and have a good grasp of basic logic, you can probably master the fundamentals of Crystal quickly. You start by giving the program a set of interrelated, short text rules. Each rule can be based on other rules and can cause one or more actions. For example, a rule in Crystal's tutorial application states that a person would be a good computer programmer if he is logical, scientific, and good with numbers. A rule can take such actions as displaying a menu or evaluating a complicated equation.

You control Crystal with pop-up menus. Its Getting Started manual contains a step-by-step description of a simple application that you can build in an hour or two. Work through that example and you will know Crystal's major features and be ready to experiment. In fact, Crystal offers more than 100 functions and commands, giving it the power of some expert sys-

tem shells that run on bigger machines.

At \$995, Crystal is expensive but within the reach of most PC applica-

## Electronic Bard

Fine artists in every medium have turned to PCs for inspiration; now it's the poets' turn. If your iambic pentameter doesn't flow freely, Michael Newman's Poetry Processor may unlock your captive muse.

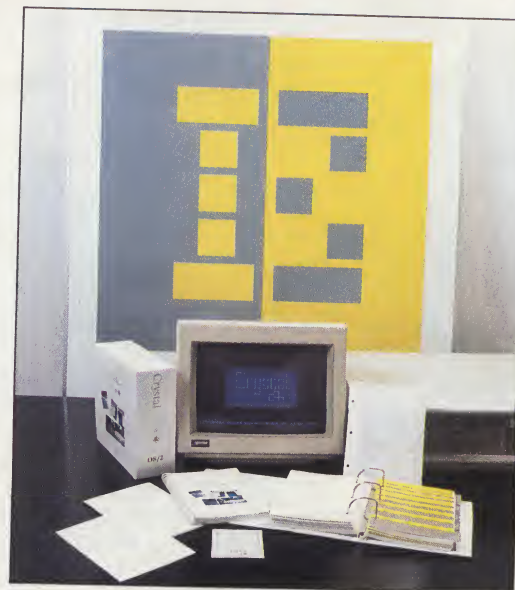
Newman, a poet, editor, and sometime biologist, champions the poetry of the well-defined form. According to Newman, expressing nuances of meaning within the constraints of a predetermined pattern of syllable, line, rhythm, and rhyme actually produces new neural pathways in the brain. The Poetry Processor embodies Newman's quixotic enthusiasm, offering tools to simplify the writing of verse that conforms to specific poetic forms.

With the Poetry Processor, you begin a new work by choosing one of the poetic forms built into the program, or by creating a form of your own (if you don't know a sonnet from a sestina, try Newman's Orpheus A-B-C, a separate software tutorial on poetic form, priced at \$49.95). Based on the chosen form's rhyme scheme, the Poetry Processor labels each line with a color (a letter on monochrome screens) so you can see at a glance which lines are supposed to rhyme.

As you write, the program's rhyming dictionary will speed the creative process at the touch of a hotkey (a caution, though: the dictionary lacks a surprising number of common words, and you're given only limited freedom to add new entries). The Poetry Processor also shows you how many syllables each line should have, and where syllabic stress should fall.

For those who write rhyming verse but eschew strict poetic forms, there's Newman's Electronic Rhyming Dictionary, or N.E.R.D., priced at \$59.95. Great for songwriters, N.E.R.D. works much like an electronic thesaurus—though at this writing, it can't pop up within your word processor—and lists words with matching vowels and consonants in addition to true rhymes.

If you're looking for poetic inspiration, the \$89.95 Poetry Processor is an interesting tool. A package including the Poetry Processor, the Orpheus A-B-C, and N.E.R.D. is available for \$189.95. Newman can be reached at 201-525-2122. —Steve Cummings



**Crystal puts expert systems within reach.**

tions developers. If that's too much, you can get your feet wet with a \$150 evaluation version, which limits you to smaller expert systems and lacks the program's interfaces to dBASE III and 1-2-3 files but otherwise contains all the features of the regular version.

Intelligent Environments promotes the program as the expert system builder for PC developers who don't know anything about expert systems, and they just might be right. If you are considering developing an application that contains an expert system, take a close look at Crystal. You can reach the company at 508-256-6412.

—Mark L. Van Name  
and Bill Catchings



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S I G M A D E S I G N S





## HighStyle for the Occasional Desktop Publisher

If you don't have much occasion to use desktop publishing software, but can see the benefits it might sometimes offer you, consider the HighStyle Document Composition System from Lattice, Inc. This combination ASCII text editor, formatter, and graphics package is just right for occasional jobs.

HighStyle comes with all the features you'd expect from a text editing and publishing package. The editor provides complex windowing, simultaneous access to up to ten files, direct access to DOS, and a respectable spelling checker.

HighStyle's heart is its

**HighStyle: easy to get into, now and again.**

formatter, which translates commands embedded in the document into type style, size, and position on the page. In this era of graphical interfaces and cut-and-paste layout, some might dismiss the formatter as a dinosaur. You don't see the page being assembled on the screen. Instead, all formatting is done with commands inserted in the text.

That's what makes the program easy to master. The commands are easy to understand and remember, and you have to learn only a few of them to handle most common document formatting tasks.

To make life easier for occasional users, the same Include command that's used to insert graphics can call up and insert separate files of boilerplate text, command files, or format templates. HighStyle comes with templates for memos, reports, and letters.

Producing graphics is a snap, too. You can create icons or logos with the icon editor, or you can use an included screen capture utility to import graphics from other programs.

HighStyle's weak point is that its page preview graphics program is unable to produce a what-you-see-is-what-you-get image of the formatted document. In graphics mode, the previewer produces a sort of

block diagram of the page layout. Illustrations show up reasonably well, but individual words are represented only by solid lines. There is no representation of type style and size. Nor does the previewer's text mode let you know where individual words will land on the printed page.

HighStyle's \$375 list price—close to that of comparable software providing reasonable Wysiwig—makes this shortcoming impossible to ignore. Even so, HighStyle is so easy to learn, and its commands are so logical and powerful, that if you need desktop publishing capability only once in a while, this program comes in handy. Lattice, Inc., in Lombard, Illinois, can be reached at 800-533-3577.

—Walt Rowinsky

## PCs & Perestroika

The PC business is booming behind the iron curtain.

There are some 30,000 PCs in the USSR today, and as many as 1.1 million will be in use by 1990. A home PC sells for about 600 rubles, or about \$970 in U.S. currency (the unofficial exchange rate would make it more like \$3,000). Of course, you'll need to go to Moscow, Leningrad, Kiev, or some other large city to buy one, and even there PCs are tough to find. So some computer users are building their own equipment to get what they want; they're forming user groups to exchange information, and the black market for U.S. software is big business.

That's the situation described by five scientists from the USSR Academy of Sciences and the head of the USSR's State Committee for Computer Technology. The Soviets came to the United States as the guests of DataEase International, of Trumbull, Connecticut, which led them on a fact-finding tour intended to improve relations between the USSR and U.S. computer-product makers. DataEase hopes to start

selling its English- and Russian-language database application software to the Soviets soon.

DIALOG, the creation of Joseph Ritchie of Chicago Research and Trading Group, Ltd., and Pyotr Zrelov of the KAMAZ truck factory in Brezhnev, USSR, represents another U.S.-Soviet joint venture. DIALOG is actively opening channels between the two countries and plans to market Soviet products worldwide.

According to Gerry Duffy, of Management Partners International, the U.S. portion of DIALOG, the Soviets are forerunners in mathematics and have produced some great probability theory and statistical software, expert systems, and games.

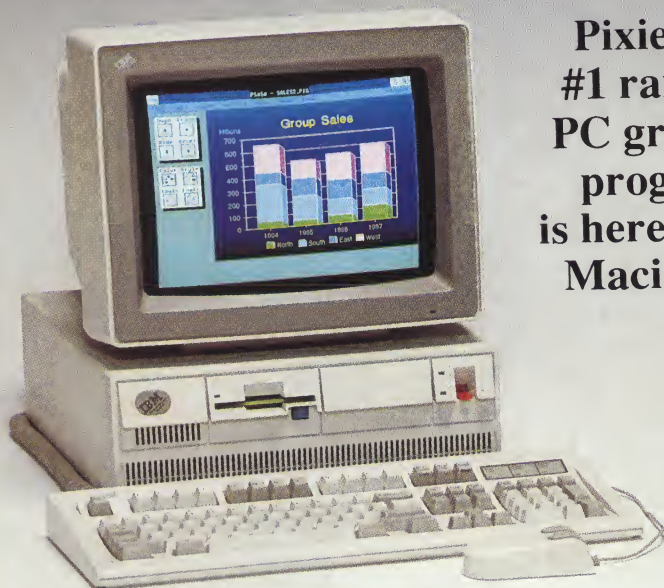
Representatives of DIALOG visited U.S. software manufacturers in August. According to Duffy, 15 U.S.

firms have expressed interest either in marketing Soviet software or in having DIALOG market their products in the USSR. —Jane Hallisey

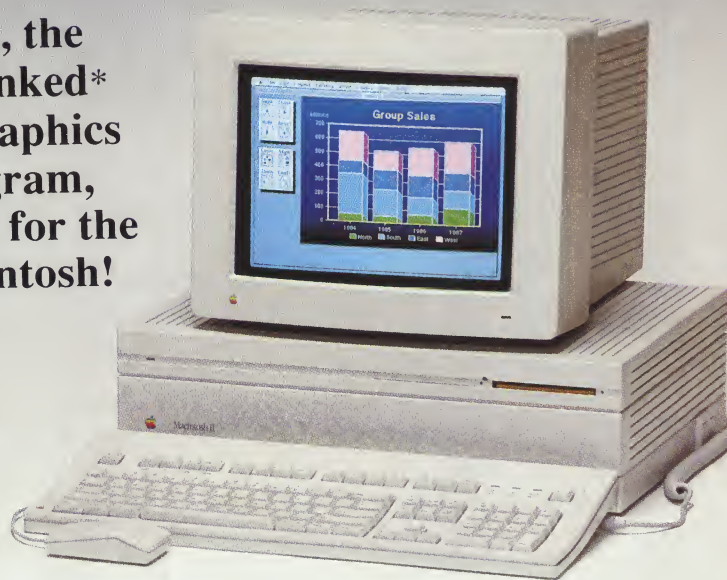




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# Brain Makers

**I**s neurocomputing coming to PCs? Neural networking, long the stepchild of artificial intelligence, has been gaining new respectability in recent years. Now it appears to be making headway among micro users.

Two new products, BrainMaker, from California Scientif-

ic Software, and NeuralWorks Explorer, from NeuralWare, Inc., offer PC users the chance to build and test their own neural networks. Both menu-driven packages run on DOS and come with extensive documentation—each including an overview of the emerging field. Simply put, neural networks

are computer systems that seek to model the brain. They are built on thousands of simulated neurons connected in much the same way as the brain's neurons. Unlike rule-based or conventional computer programs, in which information is stored in specific places in memory and in which instructions are executed sequentially, neural networks store data as patterns of interconnections.

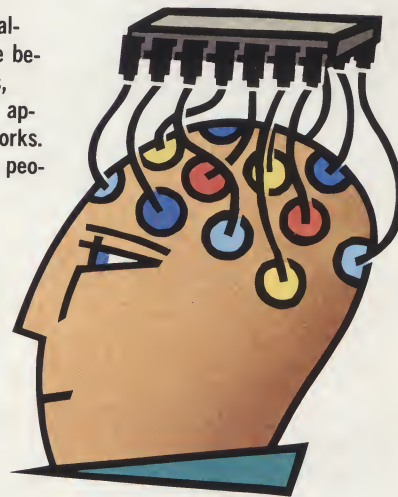
Laboratory researchers have constructed neural nets that synthesize speech, convert optically scanned characters to ASCII files, and play games. Such networks have been used by the military to distinguish whales from submarines by looking at sonar patterns. And they are making modest commercial inroads in banking, real estate, communications, and a host of other fields.

BrainMaker and NeuralWorks Explorer introduce beginners to the structures, capabilities, and possible applications of neural networks. "BrainMaker is aimed at people who have no background in neural networks, no solid background in mathematics," says Mark Lawrence, who co-

wrote the \$99.95 product for the Sierra Madre, California-based company. "It's for people who don't know anything about programming. And it's designed so that you don't have to spend eight years learning the quirks of PC-DOS."

NeuralWorks Explorer is a \$199 tutorial for the field that includes 13 network paradigms to help novices explore the underlying concepts of neurocomputing. "Some programming background might be helpful," acknowledges Jane Klimasauskas, vice president of sales and marketing for NeuralWare in Sewickley, Pennsylvania. "But we offer our own training courses for those new to the field."

Indeed, the conceptual end of neurocomputing is not inconsequential. Though both



products are intended for the uninitiated, some familiarity with the concepts and current applications of the technology is worthwhile.

NeuralWare plans to release a Macintosh version of Explorer in December. Neuronics, Inc., of Cambridge, Massachusetts, already offers MacBrain 2.0, its own neural network program for the Macintosh.

—Marty Jerome

ILLUSTRATION BY JULIA TALCOTT

## Gourmet on a Disk

Perhaps it's time to move your PC into the kitchen and add haute cuisine to its menu. Pinpoint Publishing has teamed up with *Bon Appétit* to produce a gourmet version of its Micro Cookbook called the Bon Appétit Electronic Cookbook.

Easy to load ("faster than heating the oven") and menu driven, the Bon Appétit Electronic Cookbook offers conveniences not possible with its conventional counterparts. The program can adjust ingredient levels according to the number of servings you specify (up to 299) and create an electronic shopping list. Print the list and you're off to the market.

You can customize the cookbook by adding, deleting, or modifying recipes. If you're not sure what you want for dinner, the program offers seven ways to search recipes. You can even list the contents of your refrigerator and have the program come up with recipes that use those ingredients.

Like all cookbooks, the gourmet version is written for a particular audience. Those of us who think that "gourmet" means grocery store tortellini and a jar of Francesco Rinaldi may find making fettuccine out of watercress a little too exotic. And there is one drawback to all this electronic convenience: there are no pictures, a deficiency that may dismay some cookbook lovers.

The Bon Appétit Electronic Cookbook runs on the gamut of IBM and compatible PCs and requires DOS 2.0 or later and 256KB of memory. An Apple II version is available as well. For \$59.95 you receive the basic disk plus one recipe disk with more than 190 recipes from *Bon Appétit* magazine. At least 15 add-on recipe disks can be purchased at \$19.95 to \$24.95 each.

Pinpoint Publishing, based in Emeryville, California, can be reached at 415-654-3050.

—Jan Watts

**Bon Appétit goes high-tech: recipes on a disk.**





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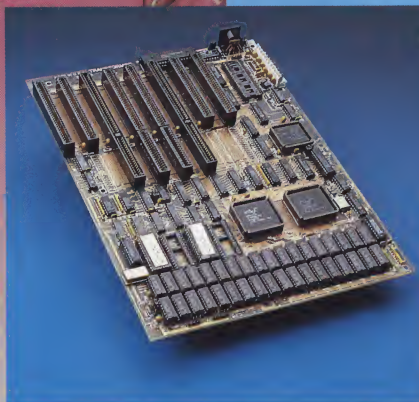


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## Oklahoma-Style PCs

**T**he state of Oklahoma was, to put it mildly, knocked on its butt when the U.S. oil industry went bust. But two Oklahoma companies and \$45 million worth of Oklahoma-made computers are helping to get the state on its feet again.

The Phillips Petroleum Company, based in Bartlesville, recently placed an order with Memorex Telex, a Tulsa-based computer maker, to purchase up to 15,000 PCs over the next three years for its Automated Management System, which links a gas station's credit card readers and electronic cash registers to a PC in the station. The PC, in turn, can be linked to remote locations, allowing station managers to send sales data, inventories, and payroll records to other stations or to Phillips headquarters.

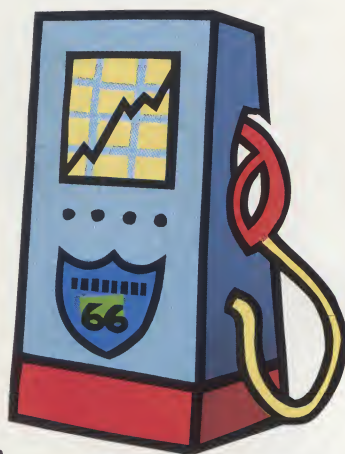
Memorex Telex will build the XT-compatible, 80286-based computers in Tulsa and will install and maintain the systems. That means jobs for Oklahomans. The Phillips deal and other contracts will allow Memorex Telex to make 200 temporary jobs permanent and add another 50 to 75 jobs within the next few months.

Jere Smith, director of media relations for Phillips, believes, "Anytime you can do that much business with another Oklahoma company, it has to be a good thing."

John Reid, director of media information for the Oklahoma Department of Commerce, agrees. Patronizing local and state businesses is important to a state that is "picking itself up by its bootstraps," he says.

Phillips claims the purchase will provide Phillips 66 gas stations with the "most up-to-date and technologically advanced automation system in the industry."

—Kenan Woods



## Update Log

The software market's "All New and Improved" products keep rolling in. Here are some notable recent upgrades:

*AskSam 4.1* includes expanded hypertext features. Global scanning allows searches across any group of specified files, and a dialog box builds in your own programming options without altering the original program. A complete context-sensitive help system is also added. Price, \$295; upgrade, \$85. AskSam Systems, Perry, Fla.; 800-327-5726. . . *Fastback Plus 2.0* adds functions like Restore Estimate, which estimates the number of files, amount of volumes, and time needed to complete the restore. Smart Restore asks for the exact number of backup diskettes needed and warns you if the wrong diskette is used. Provides mouse support. Price, \$189; upgrade from Version 1.0 or 1.01, \$20; from Fastback 5.15 or earlier, \$50. Fifth Generation Systems, Baton Rouge, La.; 800-87-FIFTH. . .

*Direc-Tree 5.4* includes a view command to browse through files in text or hex mode; the ability to add comments to filenames to describe contents; a built-in editor that sends files to the

printer from within the program; and block commands like move, copy, print, and delete. A tree diagram displays directories in alphabetical order. Price, \$49.50; \$25 upgrade for registered owners. Micro-Z Co., Rolling Hills, Calif.; 213-377-1640. . . *Freelance Plus 3.0* supports new drawing tools, including curve-smoothing and commands to align text and graphics; new fonts; and new chart types such as area, high-low-close, bar-line, and table. Includes a module for organizing and batch printing presentations. Imports, scales, and rotates TIFF gray-scale files. Price, \$495; upgrade from Version 2.0, \$100. Lotus Development Corp., Cambridge, Mass.; 617-577-8500. . . *Laser Fonts 4.0* supports WordPerfect 5.0; automatically installs existing soft fonts, allowing WordPerfect users to use bitmap font libraries; and lets HP LaserJet and compatible printers create shadow and outline versions of any font. Price, \$180; upgrade for registered users, \$25. SoftCraft, Inc., Madison, Wis.; 800-351-0500.

—Compiled by Kenan Woods

## Off to the Races

PCs are going to the dogs—and the ponies.

Software Exchange offers sports handicapping software that guides the racetrack gambler to the money. The company has versions for greyhound, thoroughbred, harness, and quarter horse races.

The no-frills handicapping

programs ask users to input statistics for each dog or horse in a race. The greyhound system, for example, asks 17 questions, including post position, odds, the dog's time in its last race, and positions at the stretch and the finish line over the last three races. With this information, the program rates the hounds and designates the

top four bets.

The software has driven some racing aficionados to bring laptops to the track, says Howard Barry, marketing director for the company.

Prices for the race handicapping software range from \$49.95 to \$239.95 for the full-blown Racing System 4, which handicaps for dog races and all three types of horse races.

Software Exchange, of West Bloomfield, Michigan, can be reached at 800-527-9467.

By the way, Barry claims that 70 to 80 percent of the software's picks finish in the money. But despite his gambling ways, he won't guarantee such a success rate.

—Peggy Wallace



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# OS/2

**Even if you don't plan to use IBM's new operating system, you can't afford to ignore it. By PAUL BONNER and PRESTON GRALLA**

**O**S/2 is a bit like religion—either you believe in it or you don't.

But even if you don't believe in OS/2—the first IBM-sanctioned PC operating system since DOS—you can't ignore the fact that others do.

No one doubts OS/2's potential. The new system's benefits range from breaking DOS's 640KB memory barrier to improving network communications, from the ability to run several programs at once to an easier-to-use graphical interface. Indeed, OS/2 zealots argue that it could be the most revolutionary step in personal computer development since the introduction of the IBM PC.

Still, even in the face of mind-numbing hype, few people outside of IBM and Microsoft, which jointly created the new system, have accepted OS/2 as the second coming of the PC operating system. The two companies have sold fewer than 100,000 copies of OS/2, compared with the more than 25 million copies of DOS already in circulation. And while DOS is still powering the applications that make computers earn their keep, most copies of OS/2 have been bought by "tire kickers" who want to test the system before making a final decision.

Confusion abounds over just what OS/2 is and what it isn't. Some users worry about the enormous





# OS

## Building for the Future

cost of the hardware needed to run the memory-hungry system. Others note the continuing absence of software to run under it, especially applications that take full advantage of its strengths. Most people buy applications, not operating systems, and until software for the new system appears in force, there will be no pressing need for OS/2.

Top off those concerns with users' leering of abandoning a solid past with DOS for an uncertain future with OS/2, and you have a perfect recipe for foot-dragging.

### What It Isn't

To understand what OS/2 is and why it seems to generate excitement and aversion in equal proportions, it is important first to understand what it is not.

Despite what you may have heard, OS/2 is not a replacement for DOS. DOS was designed to provide relatively simple, single-tasking operating system support for relatively simple PCs. If DOS applications fill your needs, you don't need to switch.

OS/2 is a complex, highly sophisticated operating system more reminiscent of traditional minicomputer operating systems than of DOS in both design and function. Moreover, its basic hardware requirements are so far removed from the limited hardware platform for which DOS was designed that they represent a new class of machines—again more reminiscent of a minicomputer than a basic computer.

A fully equipped version of OS/2 requires more than 30 times more memory, upwards of 200 times more disk storage, and a vastly higher-resolution



graphics display than the first version of DOS. Of course, DOS has grown over the years, but it retains its simple, unimposing roots.

OS/2's *raison d'être* is that some PC hardware, and some PC applications, have advanced beyond the reach of even the most creatively expanded versions of DOS. On the hardware side, today's 80386-based PCs, capable of addressing up to 4 gigabytes of RAM, are often hobbled by DOS's inability to address memory beyond 640KB without messy modifications.

Similarly, as PCs have evolved from personal productivity machines, seen on only a few desks, to the primary delivery platform for corporate information systems, DOS's ability to run only a single application program addressing a relatively small data set is no longer sufficient. In many situations, it's not enough for a PC to run either a spreadsheet or a database or a communications program; the advanced information systems now being implemented in business settings require the ability to run many programs and processes simultaneously—in a way that's transparent to the user.

As corporate users discover that the cost of training new PC users often outstrips the cost of the PCs and software they use, there is also an intensifying call for an intuitive user interface that can help reduce training costs. But such an interface can't be implemented elegantly within the memory constraints of DOS.

OS/2 is IBM and Microsoft's attempt to solve those problems. The new operating system allows multitasking, shatters the 640KB memory limit, and

*Paul Bonner, a senior editor of PC/Computing, insists that he will buy no operating system before its time. Preston Gralla, departments senior editor of PC/Computing, is waiting for a "miracle" application before he converts to OS/2.*

supports a graphical user interface. Think of it not as a replacement for DOS, but rather as a completely new vehicle that will take a new kind of PC to places where DOS cannot go. But also remember that the fare for the journey is expensive, and that no one is quite sure of the final destination.

## Multitasking, Not Context Switching

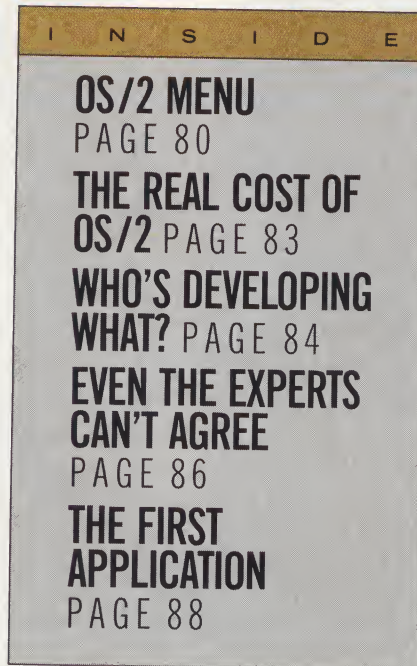
Perhaps the most important, and most misunderstood, of OS/2's new capabilities is multitasking. Many people respond to the idea of a multitasking operating system by saying, "I have enough trouble doing one thing at a time on a computer; why do I need to multitask?"

It's a question that reveals just how poorly the concept of multitasking has been conveyed to PC users. The idea behind OS/2 multitasking isn't that you are supposed to switch between a word processor, spreadsheet, and database every nanosecond, entering keystrokes in a manic frenzy. Rather, the frenzy would be contained within the computer. Your PC is supposed to do several things at once in order to let you do one thing better.

The point is this: word processing, database sorting, and spreadsheet recalculating aren't human tasks, they're tasks humans ask computers to perform in the course of doing a real job, such as writing a letter, locating an item of data, or producing a financial plan.

With a single-tasking operating system, you're forced to lead the PC step by step through all the subtasks involved in achieving your goal, and to stand by while it performs each one. For instance, if you tell the computer to do a data sort, you must wait—for seconds, minutes, or hours—while it chugs through the task.

A multitasking operating system, on the other hand, sorts the data in the background and continues to interact with you in the foreground. When you



## OS/2 Milestones

Microsoft buys all rights to 86-DOS and releases its own version, MS-DOS.

Upgraded versions of MS-DOS and PC-DOS are released, fixing bugs and adding features such as support for hard disks and print spooling.

Mid-1980

Tim Paterson writes 86-DOS, the progenitor of MS-DOS, for Seattle Computer Products.

July 1981

Fall 1981

IBM releases the PC and PC-DOS.

1982-1983



say, "Sort this data," the computer responds, "Okay, I'm doing that; what else would you like me to do while I'm working on it?"

"If you have an hour with the computer, you can get more done with multitasking than if you can only do one thing at a time," explains Wayne Erickson, founder and chairman of the board of Microrim, Inc., which has been marketing an OS/2 version of its R:base database management program since March. "A lot of database applications have things where, once you've started them, they don't need [any further] interaction from you until they're done. With OS/2 you can launch them as background tasks while you use the machine for keyboard input."

OS/2 also makes it easier to move back and forth quickly between keyboard-intensive applications. But switching from your word processor to your database to look up information isn't multitasking; it's context switching, which has been available for years under DOS through operating environments such as DESQview and Microsoft Windows, or by using

**OS/2's multitasking capabilities and its power to address large amounts of memory should pave the way for a simpler user interface. That, in turn, will make it easier to learn new applications and cut training costs.**

pop-up, memory-resident programs. OS/2 makes context switching easier by making more memory available to applications, and by eliminating memory conflicts and other problems that can make memory-resident software crash under DOS, but that's not what OS/2 multitasking is all about.

The sheer complexity of OS/2's multitasking capabilities means that it will probably be years before we see applications that fully exploit them. One example might be a spreadsheet that can automatically open a link to a remote database server as a background task and update spreadsheet cells that reference the remote data every time you open a worksheet.

In the meantime, OS/2's chief benefit, and undoubtedly one of its primary selling points, is its ability to directly access up to 16MB of RAM. Applications running under OS/2 are not limited to the paltry 640KB DOS workspace. This extra room makes it easier for applications developers to create more powerful software, because they can accommodate new functions in their programs without squeezing out space for data. If you put enough memory into a machine running OS/2, you should be able to run all the network software, background communications and terminal emulation software, and big new application programs you desire—and still have room for your 400KB spreadsheets. That's something you just can't do under DOS.

**More Complex, But Easier to Use**

OS/2's multitasking capabilities and its power to address large amounts of memory should also pave the way for simpler user interfaces. These interfaces, in turn, should make it easier to learn new applications and cut training costs. Microsoft and IBM's Presentation Manager provides a Windows-like graphical interface for OS/2 applications. But because Presentation Manager is closely tied to OS/2 and can take advantage of its huge memory space, Presentation Manager applications should be considerably more efficient than applications written to run under Windows.

"I think users are going to swarm to [OS/2 and Presentation Manager] once they've got the applications available," says Bob Bierman, senior programmer for Living VideoText, a division of Symantec, "because it gives them not only multitasking but the power of a true, integrated graphic environment."

Many developers warn, however, that the era of writing new applications in a couple of months may be over. They predict it will take a year or more for them to complete Presentation Manager versions of their applications. As Microrim's Erickson points out, a Presentation Manager application "is not the easiest thing to write." He estimates that a year from now there will be "maybe a dozen Presentation Manager applications available. We will see more and more, certainly, but it is going to take time. You don't just throw together something that uses a graphical interface."

The wait for Presentation Manager applications

IBM is rumored to be developing three new operating systems that can address large amounts of memory. Code-named Nina, Pinta, and Santa Maria, the programs are expected to run on Big Blue's 286-based

PC-2 computers. Neither the software nor the computers ever ship, but the technologies show up later in OS/2 and the PC AT and PS/2 computers.

Fourth Quarter 1983

Intel ships the 80286 chip.

June 1984

August 1984

IBM introduces the PC AT, based on the 286 chip.



## OS/2 Menu

Deciding that you want OS/2 is not enough. Many different versions and strengths of OS/2 are available, from a number of sources. Each one is appropriate for some uses but not for others. Here's a menu of OS/2 choices and what they offer.

### **OS/2 Standard Edition Version 1.0 (\$325)**

The first release of OS/2, Standard Edition Version 1.0, incorporates a multitasking kernel capable of addressing up to 16MB of real memory. It lets users run multiple applications and allows the applications themselves to run multiple processes in the background. Sophisticated intertask communications lets processes and applications swap messages and data.

Standard Edition 1.0 uses a character-based user interface similar to that of MS-DOS, not a graphical interface like the one in later versions of OS/2. It also includes a single-tasking "compatibility box" that allows users to run most standard PC-DOS applications, except communications products. This version of OS/2 requires 2MB of RAM (1.5MB without the compatibility box option). IBM shipped its version of Standard Edition 1.0 on December 4, 1987; versions from several manufacturers of PC-compatible computers followed shortly thereafter.

### **OS/2 Extended Edition Version 1.0 (\$795)**

Extended Edition, a proprietary version of OS/2 from IBM, adds

support for a variety of communications and Structured Query Language (SQL) database functions. Communications functions include support for 3270 and asynchronous emulation, and Advanced Program-to-Program Communications (APPC). The APPC protocol allows for communications between intelligent devices, supporting processing on both ends of the line.

Extended Edition has been widely criticized for supporting

### **OS/2 Extended Edition Version 1.1 (\$795)**

Scheduled for November 1988, this flavor adds Presentation Manager and Token Ring network support to Extended Edition 1.0.

### **DCA Select Communications Server (price not available)**

This product is Digital Communications Associates' alternative to the Communications Manager in IBM's Extended Edition. It will

**OS/2 choices will range from basic versions using text interfaces to advanced releases that feature the Presentation Manager interface and better networking support.**

only Token Ring networks and IBM communications boards, and for its failure to support several key IBM communications protocols. Extended Edition 1.0 requires at least 3MB of RAM. It shipped July 29, 1988.

### **OS/2 Standard Edition Version 1.1 (\$325)**

The Presentation Manager, a windowed, graphical interface similar in appearance to Microsoft Windows, makes its first appearance here. Version 1.1 will be available from IBM and makers of PC compatibles. It requires 3MB to 4MB of RAM and was scheduled to ship in October 1988.

support 3270, asynchronous, and APPC network gateways for either DOS- or OS/2-based workstations. DCA says it will ship the server in the first quarter of 1989.

### **AST OS/2 Communications Manager (price not available)**

Another alternative to IBM's OS/2 Extended Edition Communications Manager, the AST product will support 3270, 5250, and APPC communications either from standalone PCs or through local area network gateways. Gateway services will be available for both DOS and OS/2 workstations in mid-1989.

—PB

Compaq introduces the first 386-based PC.

IBM announces the PS/2 line of computers, and IBM and Microsoft announce OS/2, with first versions of the operating system to ship in 1988.

August 1986 September 9, 1986

November 1986

April 2, 1987

Intel ships the 80386 chip.

Rumors surface about a new version of PC-DOS, to be called DOS 5.0 or Advanced DOS, that will take advantage of the multitasking capabilities of the 286

and 386 chips, address more than 640KB RAM, and include a graphical interface.



may be shortened somewhat by the release of a development tool from Micrografx, Inc., of Richardson, Texas, which the company says can eliminate about 95 percent of the recoding necessary to move an application from Windows to Presentation Manager. The tool—code-named Mirrors—is scheduled to become available to corporate and commercial developers of Windows applications in late 1988.

### Converting the Doubters

The theoretical advantages of OS/2 are well known, but before it gains acceptance in the marketplace, it must first infiltrate corporate America. Individual users will not decide the fate of OS/2, because most of its advantages become evident only in high-powered business settings. Put baldly, if IBM and Microsoft can convince corporations to put cash on the barrelhead for OS/2, it succeeds. If they can't, it fails.

So far, few businesses seem convinced. While many major corporations have bought at least one copy of OS/2, they've generally stuck it in a back room for testing. Almost no one is using the system yet for productive work.

There are some fairly straightforward reasons for this resistance. First, the cost of upgrading machines to run the system can seem prohibitive, especially when only a handful of applications are available to run on it. The complexity of getting OS/2 up and running can challenge even power users.

"We're following [OS/2]; we bought a copy of it and we'll probably boot it up . . . though I'm not sure why," says Jim Ross, systems officer for the Chicago-based Continental Bank. "It's expensive to upgrade machines to run it, and there are no real off-the-shelf applications worth buying it for. We don't buy an operating system just to buy an operating system. We buy it for the applications it can run."

Ross's worries about cost are echoed in boardrooms across the country. Purchasing the 4MB to 5MB of memory needed to upgrade an AT to run the system "could run you \$3,000 per machine," notes Leslie Fiering, manager for advanced technology at Bankers Trust in New York and a member of the executive board of the Microcomputer Managers Association. And buying a new 386-based computer to run OS/2 could cost as much as \$10,000. "The numbers are not good for OS/2," she says.

On top of that, there's also the high cost of the system itself. Jim Wilt, an office systems analyst with a major midwestern aerospace company, notes, "I'm not going to spend \$700 for an operating system unless it offers some real benefits."

Memory and software are just the beginning. When all the hardware and software requirements for upgrading to OS/2 are added up, users face a

**When you add up all the requirements for running OS/2, the total outlay comes to more than \$5,000 per machine. Multiply that by thousands of PCs, and even technologically aggressive corporations will think twice before upgrading.**

total outlay of more than \$5,000 per machine (see sidebar, "The Real Cost of OS/2"). Multiply that by the thousands of PCs in many large corporations, and add in the cost of buying new OS/2-compatible applications, and you have an investment that could make even the largest, most technologically aggressive company think twice.

Fiering, at Banker's Trust, is concerned about the sheer difficulty of running OS/2. "There's real pain with it," she complains. "Just installing it is daunting and can be a two-to-three-day affair, especially because its documentation is so unclear."

Julian Horwich, executive director of the Chicago Association for Microcomputer Professionals (CAMP)—a group of decision makers who buy, install, and support microcomputer equipment for their employers—describes OS/2 as more of a curiosity than a business tool.

At a CAMP meeting earlier this year, Horwich asked how many of the members had bought a copy of OS/2. Approximately 20 percent of those present raised their hands. Next, he inquired how many people had actually torn open the shrink wrap. Only half of those who had bought it put up their hands. Finally, he asked how many people had installed it, "and

IBM announces ship dates for various OS/2 products: OS/2 Standard Edition 1.0 will ship on December 4, 1987, ahead of schedule; OS/2 Extended Edition 1.0 with Communications Man-

ager (which allows PCs to talk to servers, minis, and mainframes) and Database Manager (a relational database) will ship in July 1988; OS/2 Standard Edition 1.1, with a new graphical interface called Presentation

Manager, will ship in October 1988; and LAN Server, a version of OS/2 LAN Manager enhanced for IBM products, will ship in November 1988.

June 2, 1987

Microsoft ships the first OS/2 software development kits to applications developers.

November 3, 1987

December 4, 1987

OS/2 makes its retail debut, as IBM ships 20,000 copies of OS/2 Standard Edition 1.0.



only three or four hands went up."

Several months later, he asked the same set of questions, "and more people were running test applications, but no one had yet handed it to a user."

And users aren't likely to get their hands on OS/2 anytime soon. Even those companies taking a close look at the new operating system are far from putting it into widespread use.

Terry Jones, vice president for product development for SABRE Travel Information Network, a division of American Airlines, is considering using OS/2 on the SABRE network. Jones has been shuttling regularly between his offices in Dallas and Microsoft's headquarters in Redmond, Washington, but he won't even consider using the operating system "until all the pieces of OS/2 are in place," which he doesn't think will happen for some time. The enormous cost involved in upgrading all the personal computers on the SABRE network to run OS/2

**When OS/2 finally breaks out may depend on the development of a "killer application"—a new piece of OS/2 software so good that legions of users will run out and buy the new operating system just so they can run that application.**

means that the system "would have to provide a pretty big payoff" to make the switch worthwhile.

The payoff should come in making it easier to connect PCs and mainframes, while the multitasking capability will help busy agents process airline reservations. A travel agent could use the PC to search for the lowest possible fares as a background task, while performing another function—running accounting software, for example—in the foreground. If the agent is interrupted by someone who wants to book a flight, he could easily make another set of flight reservations while letting the accounting software run in the background by itself.

That rosy scenario remains in the future, however.

For now, even the few pioneers who already use OS/2 in their daily business lives are not necessarily finding it an improvement over DOS. Al Carrier, project leader supervisor with the Kollsman Company of Merrimack, New Hampshire, who has been running a communications program under OS/2 to upload and download information from the company's mainframe, is a good example.

"We're using it just to test it out," says Carrier. "We've been told it has some advantages for us, but we haven't seen them yet. I haven't found anything that it can do that DOS can't."

**Stalking a "Killer"**

While OS/2's immediate prospects seem shaky, even critics say its eventual acceptance is inevitable. It is simply too much of an advance over DOS to remain bottled up forever.

When it finally breaks out may depend on the development of a so-called "killer application"—a new piece of OS/2 software so much better than anything available for any other operating system that legions of users will run out and buy the system just so they can run that application. Lotus 1-2-3 was a "killer" for DOS, playing a major role in making DOS machines a business standard.

Now people are waiting for the OS/2 equivalent to emerge. And OS/2 is expected to provide the unique tools needed to create the next generation of software. Theodore P. Klein, president of the Boston Systems Group, a consulting and systems development firm, says OS/2 "provides an environment in which you can build extraordinarily sophisticated applications [that] can't be written today."

"Everyone agrees we've outgrown DOS, with its limits of 640KB of memory and single tasking," says Leslie Fiering. "OS/2, if nothing else, solves those problems. Also, a tremendous amount of industry money has gone into writing to it. Next year, everyone's favorite applications will run on it."

The million-dollar question at this point is what the killer will be, and how it will entice users to make the switch from DOS. Many people expect it to be a workgroup computing application. Others look for sophisticated networked databases to spur OS/2.

You can round up the usual suspects in the PC software business—Lotus, Microsoft, Ashton-Tate,

Microsoft ships its software development kit for OS/2 Version 1.1, which includes Presentation Manager.

April 1, 1988 May 1988

Microsoft ships its software development kit for LAN Manager to OEMs.

IBM ships OS/2 Extended Edition 1.0 to retail stores.

July 29, 1988

IBM is scheduled to ship OS/2 LAN Server and Extended Edition 1.1.

October 1988 November 1988

3Com is scheduled to ship the 3+Open LAN manager, the first retail version of LAN Manager. IBM is scheduled to ship OS/2 Standard Edition 1.1, the

first commercially available product with Presentation Manager.



Computer Associates International, WordPerfect, and so on—and discover that they're all developing OS/2 applications (see sidebar, "Who's Developing What?"), as are hundreds of other firms. But with the delivery dates for the first Presentation Manager ap-

plications still six months or more in the future, it's hard to say which, if any, of the programs now in development will be the killer.

It may take a whole cluster of new programs to push OS/2 over the top. "What's needed are business

## The Real Cost of OS/2

▶ You've read everything you can find about OS/2, and you decide it's worth taking the plunge. You're feeling pretty smug because you have a 10MHz AT with a 20MB hard disk, 1MB of memory, and an EGA graphics card and monitor. You've paid a pretty penny for your system, and you're confident it won't cost too much to upgrade your machine to OS/2 standards.

Think again. With that setup, you won't even be able to load OS/2. To scale the heights of OS/2, you'll need a lot more.

First off, you'll need memory—more memory than you ever imagined would fit into your machine. Most people agree 4MB of RAM is the bare minimum. To be on the safe side, go for 5MB.

What will an extra 4MB of memory cost? It depends on whom you buy from—and when you buy. As we went to press, the list price for 4MB of memory, plus boards to fit it into your AT, ran nearly \$3,090. You can generally get a 20 percent discount through a retailer, which would bring the cost down to \$2,448. Mail order houses might be able to get everything for you for about \$2,000.

Next comes the hard disk. Don't even think of running OS/2 on a

20MB disk—there's simply not enough room. You'll need at least 40MB of disk storage, preferably 60MB. That means adding 40MB to your present system.

The simplest way to do that is to plug in a 40MB Plus Development HardCard, which should set you back about \$800. Shopping around mail order houses may unearth one for as little as \$650.

Now comes the monitor and display card. OS/2 is heavily graphics-oriented, and, in all probability, any software written for it will be, too. So you'll want to upgrade to a VGA card. You'll also do well to purchase a multiscanning monitor, such as NEC's MultiSync.

If you buy a Compaq VGA card through a retailer, you'll spend \$440 or so, 20 percent less than the \$550 list price. Or you could buy any of the better-known generic VGA cards through the mail, at a cost of about \$290.

Now comes the monitor. List price for the NEC MultiSync is \$949. Subtract a 20 percent retail discount, and the bill comes to \$759. Again, you could buy the same monitor through the mail for much less—about \$580.

Next, you'll have to buy a mouse. Microsoft sells its rodent

for \$150, so you should be able to get it for \$120 from a retailer, or about \$110 through the mail.

You may be almost tapped out by this point, but if you want to take full advantage of OS/2, your 10MHz AT is just too slow. Many people believe OS/2 will call for a significantly faster machine, possibly a 386. Intel's Inboard 386 card will soup up your AT into a 386 machine. You can get one from a mail order firm for about \$1,000.

So now you're ready. You've added 4MB of memory, 40MB of hard disk storage, a VGA card and monitor, a mouse, and 386 power.

The total damage, depending on where you buy the hardware, ranges from \$4,680 to \$6,585, hardly spare change.

And, in a sense, that's just the beginning. Now that you have all this new hardware, you'll have to buy OS/2 itself, which could cost up to \$800, depending on which version you buy.

More importantly, you'll also have to replace all your existing software with OS/2-specific versions. Prices generally aren't available—most of the software doesn't exist yet—but everyone expects the new packages to be more expensive than their DOS cousins.

—PG

Ashton-Tate is expected to ship Ashton-Tate/Microsoft SQL Server, a high-performance, multiuser relational

database management system for OS/2-based local area networks.

By April 1989

Late 1989/Early 1990

Microsoft is expected to release a 386 version of OS/2 that will make full use of the 386 chip and the 32-bit bus. Intel is expected to ship an 80486 chip; once

again, hardware is a generation ahead of software development.

Most observers see OS/2 or Unix (or a combination) overtaking DOS as the most popular PC operating system.

1991-1992



## Who's Developing What?

Most of the country's major software manufacturers are hard at work creating new applications for OS/2 and porting existing DOS programs to the new operating system. The following is a survey of the OS/2 activities of some of the top software houses.

**ALDUS CORP.** **Program:** PageMaker **Description:** Desktop publishing software **OS/2 Version Due:** Mid-1989 **Comments:** Will use Presentation Manager

**ASHTON-TATE** **Program:** Ashton-Tate/Microsoft SQL Server **Description:** Multiuser relational database management system **OS/2 Version Due:** April 1989 ■ **Program:** dBASE IV, Version 1.0 **Description:** Database management system **OS/2 Version Due:** October 1988

**BORLAND INTERNATIONAL** **Program:** Paradox **Description:** Relational database **OS/2 Version Due:** May 1988

**CC:MAIL, INC.** **Program:** cc:Mail **Description:** Electronic mail system **OS/2 Version Due:** October 1988 **Comments:** New versions are due as LAN Manager and Presentation Manager become available

**COMPUTER ASSOCIATES INTERNATIONAL, INC.** **Programs:** SuperProject Expert/2 and ACCPAC Plus System Manager/2 **Description:** Project management and accounting software **OS/2 Version Due:** March 1988 **Comments:** Presentation Manager versions under development. version of SuperCalc also under development

**CONETIC SYSTEMS, INC.** **Programs:** Higgins Group Productivity Software and Higgins Single User, Release 2.2 **Description:** Integrated workgroup productivity package, with electronic mail; and personal information management software **OS/2 Version Due:** August 1988 **Comments:** Presentation Manager versions anticipated, but not yet under development

**DATAEASE INTERNATIONAL, INC.** **Program:** DataEase **Description:** Relational database **OS/2 Version Due:** 1989

**DIGITAL COMMUNICATIONS ASSOCIATES** **Program:** E78 Plus for OS/2 **Description:** 3270 emulation software **OS/2 Version Due:** First quarter 1988 ■ **Programs:** DCA Select Communications Server and DCA Select LAN Manager **Description:** Local area networking software **OS/2 Version Due:** Early 1989

**IBM** **Program:** DisplayWrite 4/2 **Description:** Word processing software **OS/2 Version Due:** February 16, 1988

**INFORMATION BUILDERS, INC.** **Program:** PC/FOCUS-MultiUser **Description:** Database management system **OS/2 Version Due:** July 1988 ■ **Program:** Level 5 **Description:** Expert system development shell **OS/2 Version Due:** Mid-1989

**INFORMIX SOFTWARE, INC.** **Programs:** INFORMIX-4GL, INFORMIX-SQL, INFORMIX-ESQL/C, and C-ISAM **Description:** Relational database management system **OS/2 Version Due:** February 1988 **Comments:** OS/2 version of SmartWare business productivity software under development



**LOTUS DEVELOPMENT CORP.** **Program:** 1-2-3, Release 3 **Description:** Spreadsheet  
**OS/2 Version Due:** Fourth quarter 1988 ■ **Program:** Agenda **Description:** Personal information manager  
**OS/2 Version Due:** After the release of Presentation Manager ■ **Program:** Notes **Description:** Workgroup management software  
**OS/2 Version Due:** After the release of Presentation Manager ■ **Program:** Lotus/DBMS **Description:** Database management system  
**OS/2 Version Due:** After the release of Presentation Manager

**MANHATTAN GRAPHICS CORP.** **Program:** Ready, Set, Go! **Description:** Desktop publishing and word processing software  
**OS/2 Version Due:** Second quarter of 1989

**MICROGRAFX, INC.** **Programs:** Draw Plus, Graph Plus, and Designer **Description:** Drawing programs  
**OS/2 Version Due:** January 1989 **Comments:** OS/2 versions of Draw Plus, a desktop publishing graphics program; Graph Plus, a combination worksheet, text, and chart package; and Designer, a technical illustration product, are under development

**MICROPRO INTERNATIONAL CORP.** **Program:** WordStar 2000 **Description:** Word processing software  
**OS/2 Version Due:** No date announced

**MICRORIM, INC.** **Program:** R:base **Description:** Database management system  
**OS/2 Version Due:** First quarter of 1989 **Comments:** OS/2 version of R:base Compiler, which translates applications code into machine code, due first quarter of 1989

**MICROSOFT** **Program:** Microsoft Word **Description:** Word processing software  
**OS/2 Version Due:** Fourth quarter of 1988 ■ **Program:** Multiplan **Description:** Spreadsheet  
**OS/2 Version Due:** July 1988 ■ **Program:** Excel **Description:** Spreadsheet  
**OS/2 Version Due:** After the release of Presentation Manager

**ORACLE CORP.** **Program:** Oracle **Description:** Relational database  
**OS/2 Version Due:** October 1988

**PETER NORTON COMPUTING, INC.** **Program:** The Norton On-Line Programmer's Guides  
**Description:** Online guide to information found in ten volumes of OS/2 manuals  
**OS/2 Version Due:** February 1988

**REVELATION TECHNOLOGIES, INC.** **Program:** Advanced Revelation for OS/2  
**Description:** Database management system for use on sophisticated networks  
**OS/2 Version Due:** November 1988

**WORDPERFECT CORP.** **Program:** WordPerfect **Description:** Word processing software  
**OS/2 Version Due:** First quarter 1989

**XYQUEST, INC.** **Program:** XyWrite III Plus **Description:** Word processing software  
**OS/2 Version Due:** Mid-1989




solutions [running under OS/2] that people fall in love with," says CAMP's Julian Horwich.

One reason to look for a whole gang of lovable new applications, rather than a single killer, is that the PC market has changed dramatically since 1-2-3 first shoved microcomputers onto corporate desktops. In the early 1980s, PCs were filling a void, but today's PC environment is crammed with highly specialized applications. OS/2's market penetration will probably occur in dribs and drabs, as applications are developed to serve market niches better than they are served with applications that run under DOS.

For some users, the release of a spreadsheet program that can handle 500KB worksheets more efficiently than those running under DOS may be the hot button that makes them switch. For others, it might be advanced computer-aided design packages, or minicomputer-strength database systems. In other cases it could be advanced development tools that ease in-house development of vertical applications.

But those users who find basic 8088-based PCs acceptable for tasks such as word processing or data entry may never have a compelling reason to switch. "No one needs OS/2," says Bob Bierman. But some

## Even the Experts Can't Agree

 We asked a selection of computer-industry luminaries for their thoughts about the future of OS/2. They agreed to disagree:

### **Ed Esber** **Chairman and CEO** **Ashton-Tate**

"The adoption rate of OS/2 will be a little slower than we had anticipated a year ago, because we think the majority of the OS/2 Presentation Manager applications won't be out until late 1989 and into 1990."

### **Paul Grayson** **Chairman and CEO** **Micrografx, Inc.**

"OS/2 acceptance will be faster than most people think. There is a lot of talk of the killer application that will make all the difference. I think it's a myth. [And it] could inhibit the acceptance of OS/2 if people are waiting for it to appear."

### **Bahar Gidwani** **Software analyst** **Kidder, Peabody**

"Within two years, something will have overtaken DOS; I'm just not sure what. I think in two years DOS will be 40 percent [of the market], with the other 60 percent belonging to either Unix or OS/2. In five years DOS will be about 10 percent or less. In ten years, I think DOS will be 0 percent."

### **Peter Norton** **CEO**

#### **Peter Norton Computing**

"I mean, give me a break—I would like to see someone come up with a scenario where 10 or 20 or 30 million DOS users are going to throw away their Lotus and their this and that and switch over to OS/2. OS/2 is not going to overtake DOS. OS/2 will create its own world; DOS will go on forever."

### **Rick Sherlund** **Software analyst** **Goldman, Sachs**

"OS/2 has been bashed a lot because there is no compelling reason to buy it. But when applications start rolling out, things should change."

### **Edward Thomas** **General manager** **Compu-Add Corporation**

"OS/2 will not make any ripples before 1991-1992 with the medium-to-small-end guy. There is clearly a place for [OS/2]—it's just at the very high end."

### **W.E. "Pete" Peterson** **Executive vice president** **WordPerfect Corporation**

"I'm surprised that the industry is so optimistic that OS/2 will be the dominant operating system so fast—most people just don't need it. I'd really be surprised if OS/2 overtakes DOS before 1992."

### **Winn L. Rosch** **Contributing editor** **PC/Computing**

"Although it's new, people are already treating OS/2 as if it were a museum piece. They look at it with great curiosity, and then they stroll on to something they find more interesting."

### **Jonathan Rotenberg** **President**

#### **Boston Computer Society**

"I'd be surprised if [OS/2 overtakes DOS] before 1991. Through the end of 1989, it will be difficult for any user to justify the expense of OS/2. There are so many hurdles in the jump from DOS to OS/2, and there aren't really any knock-'em-dead compelling benefits."

### **Michael Dell** **Chairman and CEO** **Dell Computer Corporation**

"A lot of users will continue to be satisfied with DOS functionality ... [but the 386 version of OS/2] will really allow OS/2 to hit its stride."

### **John Hild** **President** **XyQuest, Inc.**

"Microsoft and IBM are not together on what is going to be delivered. Microsoft is offering the product but is saving some goodies for the clone makers."



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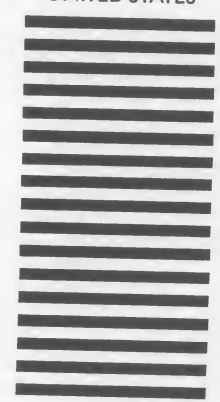
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users "need applications that are more advanced, and those applications happen to need OS/2 to run."

Robert Frankston, Lotus's chief scientist and co-author of the ground-breaking VisiCalc program, feels, "It's not a question of whether [OS/2 will become dominant], but when. Applications are running out of steam under DOS."

Even as applications begin to appear, it remains anyone's guess as to when OS/2 will become the dominant PC operating system—and the guesses span a pretty wide range.

Microsoft acknowledges that the migration will

take some time. "Our position has been that it will be a slow process to move from DOS to OS/2," states Mark Mackman, Microsoft's OS/2 product marketing manager. He estimates that OS/2 will start to outsell DOS sometime in late 1990 or early 1991. Other estimates range from mid-1989, when software written for Presentation Manager will begin to come out, to the mid-1990s.

### **The Operating System That Wouldn't Die**

No matter how successful OS/2 becomes, DOS won't go the way of CP/M and other orphan operating systems, at least not right away. No one questions that OS/2 will lead to new applications offering functionality and ease of use beyond that of the DOS environment, and most developers expect that OS/2 will eventually dominate the PC arena, but Living VideoText's Bierman is planning for a world where DOS and OS/2 live side by side. He points out that "DOS can't go away... There are too many 8088 and 8086 machines out there that can't run OS/2." Bierman expects that "once the applications are

#### **Jim Seymour Editor-in-chief PC/Computing**

"I think we'll see fewer than 20 percent of business PC users using OS/2 two years from now—and not more than 50 to 60 percent five years from now. And I don't expect to see OS/2 bury DOS in the foreseeable future: the number of people who just don't need what OS/2 can do is large, and growing."

#### **Mike Swavely Vice president, sales and marketing Compaq Computer Corporation**

"I think that the momentum in the direction of OS/2 is absolutely applications-dependent. Remember that most customers don't buy an operating system, they buy applications. Without strong new applications, there is no pressing demand for OS/2. [But] I absolutely believe that [killer applications] are out there."

#### **Robert M. Kavner President AT&T Data Systems Group**

"Sure, we'll support OS/2 when it's clear it has become a de facto standard... It's not clear now that customers want another operating system. But PC users today need to communicate and share information, [and] that's where the Unix system shines." ■

**Corporate buyers have made it clear that they treasure compatibility with their existing applications above all other factors, and software developers will ensure that users can move files back and forth between DOS and OS/2 programs.**

there, maybe a third of users will go to OS/2. Then it will stabilize at that level for a couple of years before going to 60 percent over the next five years."

Abraham Poznanski, president of Computer Associates' micro products division, predicts, "Eighty percent of the overall market is probably going to still be DOS for the next couple of years. One of the realities is that DOS hasn't necessarily been totally exploited. To the extent that there's room to offer the kind of things people are looking for without the huge investment that a new operating system will entail, we want to bring those things to the marketplace."

It seems clear that OS/2 and DOS will coexist, at least for the foreseeable future. So what happens when your coworkers are running DOS and you're running OS/2, or vice versa? Will you be able to exchange files or work on the same database?

The answer is undoubtedly yes. Corporate buyers have made it clear that they treasure compatibility with their existing applications above all other factors, and software developers will ensure that users



## The First Application

OS/2 is likely to make its initial inroads in areas where the limitations of DOS are most evident. One such area is networking. It was no accident that Microsoft announced the OS/2 LAN Manager network server software on the same day that OS/2 was announced.

Today's DOS-based network software is severely constricted by the memory limitations and single-tasking nature of DOS. On the workstation end, network software can occupy so much memory that it becomes almost impossible to run full-size applications at the same time.

On the LAN server side, the limited memory and lack of multitasking mean that DOS-based network file servers can't do their jobs effectively. The limitations of DOS have stymied the development of database servers, communications gateways, and multiuser applications for PC LANs.

Many observers believe that OS/2 will find its first home on network servers. Gupta Technologies, in Menlo Park, California,

has already shipped an OS/2 version of SQLBase—a database engine for network workstations running its SQLWindows software. OS/2's multitasking capability should help popularize database engines, which use a technique called cooperative processing to boost network performance by reducing the amount of data that must flow across the network.

To get a list of employees making over \$100,000, for example, a traditional LAN server sends the entire employee database to the workstation, which then extracts the desired list. Using cooperative processing, the network server extracts the list and sends only the results to the workstation. This reduces network traffic and makes the network more efficient.

Rod Zimmerman, Gupta's manager of product marketing, says that the first OS/2 version of SQLBase, which shipped in July, is about 20 percent faster than the DOS version, and he expects subsequent versions to be even faster. Zimmerman is confident that cus-

tomers will quickly switch to the OS/2 version, but he doesn't anticipate an immediate demand for Presentation Manager-based workstation software to replace the firm's current Windows- and DOS-based offerings. "It's now apparent that you'll need an 80386 machine with a lot of memory to run Presentation Manager as a database client," he says. "As a practical matter, Presentation Manager will be too slow to run a serious database application on an 80286."

"We see people going to OS/2 in steps. The first step is to make the server an OS/2 machine while the client workstations remain DOS machines. When you have an 80386 or, in the future, an 80486 machine as a server, 80286s using DOS and Windows are just fine as clients."

So, while OS/2 will first enter the PC world to help make LAN software more efficient, that probably won't be enough to propel it past the network server hidden in a utility closet and onto users' desks. Almost no one uses a PC primarily to run network software. —PB

will be able to move files back and forth between DOS- and OS/2-based applications.

"Any software developer who... fails to provide effective bridges between DOS and OS/2 fails in meeting customers' true needs," says Poznanski.

The prospect of compatibility is also good news for PC users who take office applications home. Few users are going to make the investment to upgrade their home computers to run OS/2, and the compatibility that developers are promising between OS/2 and DOS applications should make such a move unnecessary, at least for now.

### To OS/2 or Not to OS/2?

OS/2 has a lot to offer, but the price is high. Moving to OS/2 from DOS will make network communications easier, offer room for bigger databases and more complex applications, let your computer do several things at once, and allow a simpler interface.

To take full advantage of all this, you'll need several thousand dollars' worth of hardware upgrades, or a new 80386-based PC—not to mention new applications and the operating system itself.

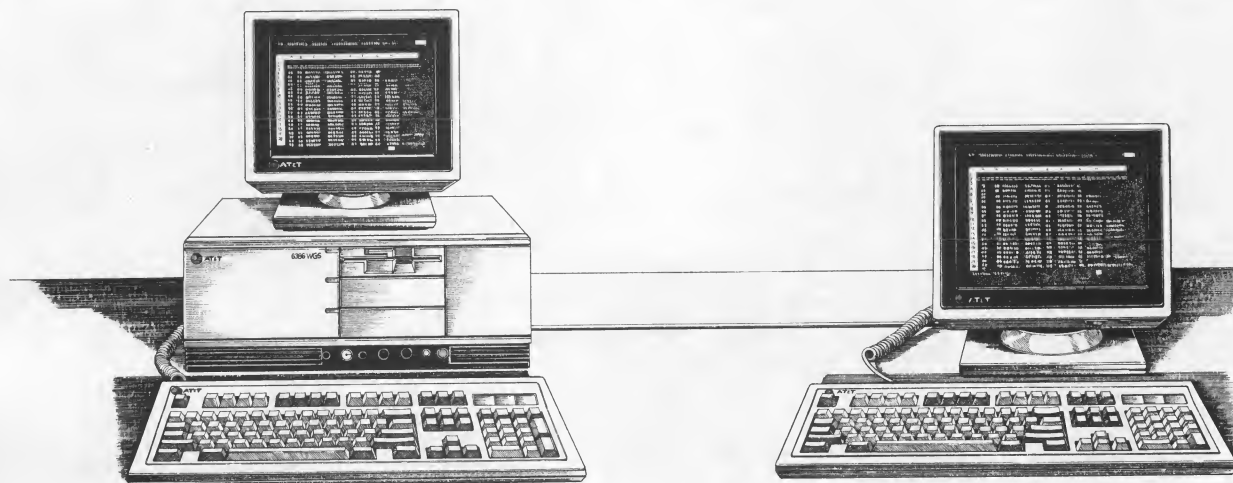
So far, most of OS/2's advantages assist software developers, not users. As office systems analyst Jim Wilt puts it, "If I were a developer, I'd rather write to OS/2 than DOS. But today, I'd rather be a user of DOS than OS/2."

Even after OS/2 fever eventually spreads to users, DOS will stick around like a trusted friend for the millions who are comfortable with it and don't chafe at its limits.

Perhaps the best advice about switching to OS/2 echoes the words of wisdom that progressive parents impart to their adolescent children concerning sex: "It will be a beautiful experience, but there's no need to rush it. And don't let anyone pressure you into doing it before you're ready." ■



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• Research	• Have Tom break down market research results into best case/worst case scenarios.	• Tom	• Marketing
• Distribution Vendors Pricing	• Tom will have his report in by a week from Friday; make sure it covers pricing, strategy, distribution, and implications of using outside vendor for typesetting and printing.	• Tom	• Marketing
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If you use RAM-resident programs such as spell checkers, desktop organizers or keyboard macros on your PC, you know these "pop-up" programs provide convenience and enhance productivity.

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PopDrop will also let you manipulate programs that reside in EMS—so you won't have to perform mental gymnastics just to "make room" for programs you need to run. PopDrop is an excellent tool for making different software resident when you switch to another program. And PopDrop won't interfere with your backup program.

Voted one of "The Best Of The Best Utilities" by *PC Magazine*, PopDrop is one program you shouldn't be without.

### **PopDrop Divides Your RAM Into "Layers"**

PopDrop works by dividing your memory into layers (up to 16) each of which may contain several programs. After loading DOS and your permanent programs, RAM-resident programs are loaded with these layers between them, the most permanent at the bottom, the least permanent at the top. You can create batch files to remove layers one at a time or several at once.

### **And PopDrop Is Amazingly Memory-Efficient**

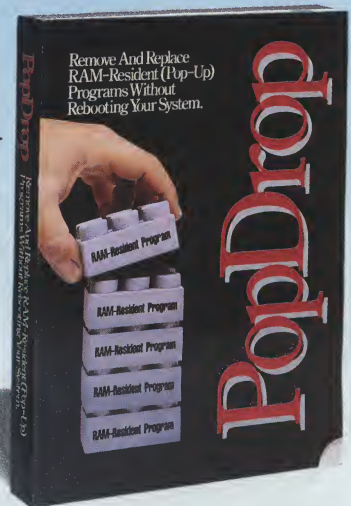
Other products gobble up to 40K of your precious memory. PopDrop provides unmatched power and flexibility and occupies only 0.6K for the first layer, and 0.2K for additional layers.

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For example, if you want to run a RAM disk, a print spooler and one or more pop-up programs most of the time, but need them out of the way to work on a large spreadsheet, you can do it easily with PopDrop. If you need different programs resident when you switch to another application—it's no problem. In fact, you can easily use PopDrop in your batch files to make this automatic.

In addition, PopDrop will let you "activate" and "deactivate" programs in a specified layer of RAM to avoid conflicts with the program you're using.



PopDrop is available in 5 1/4 or 3 1/2 inch diskettes.

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# TAKE-OUT POWER: 386 PORTABLES

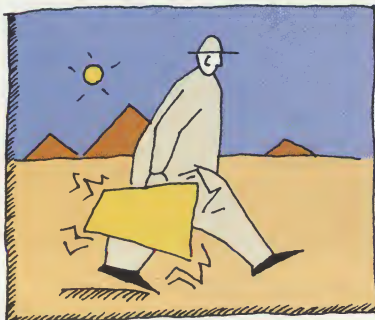
**T**he fire-breathing power of an 80386 processor in a transportable computer is something to set your spirits aloft, but watch out for the crash: you can forget about light weight, reasonable price, and—for the most part—battery power.

These hefty-weight, hefty-price machines from Compaq, GRiD, NEC, Toshiba, and Zenith make personal computing more personal and more powerful, but they're far from being "lapmans." The 386 portables are more like small self-contained computers for use on desktops—not laptops—in remote locations, away from your main office, in a hotel room, or for use both at the office and at home. That's where and how they really shine.

For power-hungry users in remote locations, these machines come to the rescue to run complex applications better and faster. With the power and performance of a 386 laptop or portable, field engineers, scientists, researchers, accountants, sales reps, service technicians, and military and government personnel can run specialized applications that 80286 machines won't run and work with multitasking software such as Microsoft Windows/386. At the same time they can take advantage of the smaller machines' compact size and portability—just what's called

**By CAROL OLSEN DAY**

All the speed limits have been lifted from portables—it's the civilized way to compute away from home, as long as you don't have to carry the big lugs around. The 386 portables we put to the test weigh in at a chunky 13½ pounds for the high-tech-trendy GRiDCase 1530 to a jumbo 21 pounds for the ground-breaking NEC



PowerMate Portable SX, the first portable to use Intel's 386SX technology. (See *PC/Computing*, September, for more on the 386SX.)

**More, More, More!** Despite the drawbacks of heavy weight, high price, and nonexistent to negligible battery power, some recent innovations have not only made luggable 386 portables possible, they've also made them better machines, with CMOS chips, faster clock rates, expansive memory, nifty new displays, the addition of standard slots for add-in boards, and expansion hardware such as external disks and modems.

Without CMOS (complementary metal oxide semiconductor) chips, 386 portables would be even larger and heavier. CMOS technology packs more

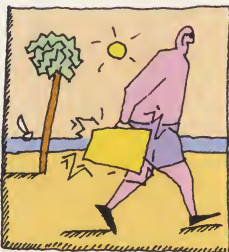
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no means too  
thin, but, boy,  
do these 386s  
have it all.**



power onto smaller chips, which also helps cut power consumption. Faster clock rates—up to the Compaq's 20MHz—mean that the machines are able to process your applications faster. And the 386 portables don't stop at 640KB. The GRiDCase, for example, gives you up to 8MB; the Compaq, up to 10MB. In addition, their storage capacity—from 10MB to 100MB—equals or surpasses what you can get from a desktop AT.

The hard disks on the 386 portables are power-eaters. Although all the manufacturers have designed them in a way that helps reduce power consumption, hard disks are still responsible for laying waste to battery power.

Regarding battery stats, here's the good and bad news: Compaq no, GRiDCase yes, NEC no, Toshiba no, Zenith yes. Why don't all 386 portables have battery power? When manufacturers juggle battery power with the demands of power-hungry hard disks, VGA and EGA screen technology, and other features, battery power usually loses out.



How much power the hard disk consumes depends on how much you need to access the disk. With 10MB of RAM available, you can conserve power by loading a lot of data from the disk into memory at once and keeping read operations to a minimum. But entering data will require frequent disk access, which increases battery use. We're still waiting for a lightweight battery that stores a large amount of power.

As for the displays, they're brighter and clearer than ever. And EGA has arrived in the portable world. (For more on the state-of-the-art screen technology used for these machines, see the accompanying sidebar, "On the Small Screen.")

If you don't like the display, you can hook up an external monitor more easily on one of these machines than on earlier portables. Expansion slots for various add-ons are more accessible on the best of them. The slots enable a team of engineers, say, or sales reps or accountants, to add network cards to set up a mininetwork in the field or to connect their machines to a mainframe back at headquarters.

Another common use for an expansion slot is for adding an EGA or VGA color graphics card, which lets users hook up a color monitor and use the portable to present demos in state-of-the-art color. The NEC supports EGA and VGA, and the Toshiba supports EGA without the addition of a card, but the

other machines support only CGA. Despite the fact that all the machines can drive color monitors, CGA just won't do for professional-quality demos.

The NEC PowerMate Portable SX features three full-length, 16-bit expansion slots, which you can reach easily through the top of the computer. In addition, it has a universal keyboard socket and a 15-pin analog monitor output. The Toshiba T5100, on the other hand, has a single slot for an internal modem or an interface card, which in turn will plug into a five-card expansion chassis that you can use to add local area network interface cards. (You can also equip the T5100 with Toshiba's FloppyLink to connect the portable to a desktop PC, enabling it to use the desktop's floppy disk.) The GRiDCase can accommodate expansion cartridges for its GRiDCase 1530 that offer 3270, VGA, and GRiDLink LAN support.

Advances in the technology have made these machines more powerful, and it's pretty amazing that they can pack so many features into so small a computer. But we want more, or actually less, from a 386 portable. We want less heavy, less bulky, less costly, less AC-power-dependent laptop-size 386s. Then we'll want them on our laps on trains, planes, and automobiles as well as on our desks at the office, in the field, and at home.

We know that the manufacturers are with us on this—it's just a matter of time before we can get everything in a small enough package. How long is anyone's guess. Some sketchy reports—of battery makers working to develop smaller batteries with longer durations and of display makers striving to produce color, and even projection, screens—are encouraging. But we want it now.

### Do You Know What You're Doing?

Think about it: if you can settle for less than a 386 and all you really want is a lightweight computer to travel with, primarily to receive and send e-mail and to make notes or work on documents, you'd be better off with a bare-bones machine like the Toshiba T1000—unless you have a valet like Lord Peter Wimsey's Bunter to carry your portable for you, or a resident chiropractor to take the kinks out of your back and shoulders. Add about 15 pounds to the 6 or so you'd be lugging if you were carrying the Toshiba T1000, and you get the 20 to 21 pounds of the NEC PowerMate Portable SX and the Compaq Portable 386. Even the lightest portable we looked at, the 13½-pound GRiDCase, still is more than twice as heavy as the Toshiba T1000.

And don't forget the bottom line: price. These machines can turn the figures in your account books magenta. Ranging from \$6,595 to \$7,999 without added-cost options like modems, external floppy drives, and the like, these portables pack a financial wallop along with 386 power. It's enough to make

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*Carol Olsen Day is features senior editor of PC/Computing. She hesitates to lug a 386 portable on her commute to New York via the Pan Am shuttle but loves the idea of all that power. Her interview with computer artist Barbara Nessim appeared in our October issue.*



even the most power-hungry stop and think, especially since you can get a fully equipped desktop 386 for less than half that amount.

But if you really need 386 power in a portable, don't be dissuaded. All five machines fit the bill. Here's what our editors think of them.

#### COMPAQ PORTABLE 386

##### Heavyweight Contender

The Compaq Portable 386 is the Mike Tyson of the transportables. It's a heavyweight in every sense of the word—and therein you'll find its weaknesses and its strengths.

The Compaq is renowned for its brute force. Running at 20MHz, it's about as fast as anything you can put on your desktop. In fact, with a hard-disk storage capacity of 40MB (a 100MB option is available for

But all this muscle comes at a price, particularly in terms of bulk and weight. The Compaq Portable 386 tips the scale at just over 20 pounds, so you can expect a workout every time you have to lug it for more than a few minutes. It won't win any contests for svelteness, either. Spend much time carrying this machine around and your biceps may soon begin looking more like the heavy-weight champ's and less like a 98-pound weakling's.

Since the Compaq packs so much power, it can't run on batteries. Considering its size and the fact that you're bound by the umbilicus of a power cord, you can think of the machine as a desktop computer that you can move from place to place rather than as a portable.

Like the heavyweight champ, the Compaq looks more utilitarian than graceful. If you're a lover of concrete-slab architecture, or of proletarian art of the 1930s featuring strong-armed, iron-jawed workers wielding wrenches and pitchforks, you'll love the look of this machine. I find it boxy, industrial-looking, and graceless.

Like many of its high-priced brethren, the Compaq Portable 386 features a gas plasma screen. The orange-on-orange display is decidedly hard on the eyes. To make matters worse—although a brightness control allows you to adjust overall screen

brightness—there's no contrast control. The orange plasma is an improvement over the barely readable screens on smaller laptops, but considering the price of the machine, and the fact that it binds you to a power cord, Compaq should be able to do better.

If you tire of the plasma display, you can hook up an external monitor to a port on the rear of the machine. The Compaq offers only CGA output—also surprising for such a high-priced machine. If you want higher resolution, you'll have to buy a display adapter and hook it up yourself. Fortunately, Compaq has made it easy to add display adapters and other expansion cards. A \$199 piggyback unit that holds up to two 8- or 16-bit expansion cards snaps onto the back of the computer. The expansion unit adds even more bulk and weight to an already over-

#### Compaq Portable 386

**List Price:** \$7,999

**Dimensions:** 10 by 16 by 8 inches (HWD)

**Weight:** 20 pounds

**Display:** Gas plasma, supports CGA graphics

**Memory:** 1MB

**Disk Drives:** 40 or 100MB hard; 5¼-inch, 1.2MB floppy; external 3½-inch drive available

**Options:** MS-DOS 3.2, \$95; 2-slot, 16-bit expansion unit, \$199; 1MB RAM expansion kit, \$799; leather carrying case, \$225

Compaq Computer Corp.  
20555 FM 149  
Houston, Tex. 77070  
800-231-0900



**As you might expect, the Compaq Portable 386 is all business. It's extremely fast, rugged, and compatible, but it weighs 20 pounds and offers no internal expansion. Plus, the screen does not support EGA or VGA graphics. With its \$7,999 price tag, the Compaq may make you wonder just who is getting "the business."**

\$2,000 extra), 1MB of RAM (expandable up to 10MB with special boards), and a 5¼-inch 1.2MB drive, the Compaq is more powerful than the computers on most people's desks.

The machine is also as sturdy as the heavyweight champ. Inside the hard plastic shell, a healthy amount of steel holds everything together so well that the Compaq should be able to take a fair amount of physical abuse.

PHOTOGRAPHS BY STEVEN GREENBERG



sized machine, but it enables you to add or remove options in seconds.

The full-featured keyboard is more like that of a desktop PC than a portable. You won't suffer from finger cramps even after typing for a fairly long time. The feel is about the same as that of Compaq's full-sized keyboards; some people describe them as mushy, others simply call them fast.

The Compaq Portable 386 resembles Mike Tyson in another way: price. For a ringside seat you'll have to fork out \$7,999. What you get may not be pretty, but it's bound to flatten the toughest work you can throw at it.

—Preston Gralla

**DeJean counters:** *The Compaq is still the best combination-of-ingredients product on the market. Picking on its gas plasma screen because it's not a CRT is unfair; it's the best damn plasma screen available. The contrast actually gets better in a reasonably lit room.*

—David DeJean



Certainly the most stylish portable, the GRiDCase 1530 features a dazzling gas plasma display. It's also the only battery-powered portable 386 that you can actually use on your lap. Unfortunately, the GRiDCase is crippled by its poor keyboard layout.

#### GRIDCASE 1530

##### James Bond Meets MoMA

It's not surprising that the Museum of Modern Art has a GRiD Systems laptop in its design collection. The new GRiDCase 1530 may actually be the best-looking computer ever. Its sleek lines and matte-black finish make it the high-tech equivalent of a Michael Graves teapot, while its orange-on-black gas plasma display could

be described as the laptop screen of the gods.

With its 80386 chip running at 12.5MHz and a 40MB hard disk in a densely packed unit, the GRiDCase 1530's performance lives up to its looks. Made of tough magnesium alloy, the GRiDCase is the type of laptop computer that Q might hand to James Bond before a tough assignment. The Secret Service's equipment chief might even consider it unnecessary to give his typical warning to 007 about not breaking the thing. Sold only directly to, and intended for use by, field professionals such as sales reps, service technicians, and military and government personnel (not to mention secret service agents), the GRiDCase is designed to survive rude treatment and unfriendly operating environments.

Alas, all is not perfect: even though the GRiDCase is small, it's heavy at 13-plus pounds. Despite its laptop configuration, I don't recommend resting the GRiDCase on your knees for very long.

Like many laptop keyboards, the one on the GRiDCase is seriously cramped, like the back seat of a tiny Japanese car. And at almost \$8,000 fully equipped, it costs just about as much as an economy car. But the GRiDCase is a high-performance model, and its 386 processor, plasma screen, and 40MB hard disk combine to eat electricity as fast as a

Ferrari gobbles gasoline. You'll need to refuel the GRiDCase frequently; a full battery charge lasts only about 40 minutes.

Still, that's about 40 minutes longer than most of the other 386-based portables will operate without being plugged into an AC outlet. And the GRiDCase

#### GRiDCase 1530

**List Price:** \$7,995

**Dimensions:** 2.3 by 15 by 11½ inches (HWD)

**Weight:** 13½ pounds

**Display:** Gas plasma, supports CGA graphics

**Memory:** 1MB

**Disk Drives:** 20MB hard and one 1.44MB floppy; two 1.44MB floppies; or 40MB hard (no floppy)

**Options:** MS-DOS 3.21, \$150 (mandatory); 5¼-inch external 360KB floppy drive, \$395; 2,400-bps modem, \$595; extra batteries, \$90 each

GRiD Systems Corp.  
47211 Lakeview Blvd.  
P.O. Box 5003  
Fremont, Calif. 94537  
800-222-GRID  
415-656-4700

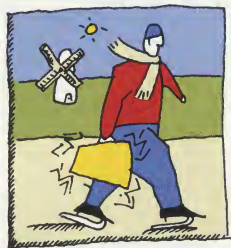


## The GRiDCase 1530 is the type of laptop computer that Q might hand to James Bond before a tough assignment.

does more on batteries than most computers can manage with all the power of the Hoover Dam behind them.

The GRiDCase comes with 1.4MB of standard memory, expandable to 8MB. Expansion options, which plug into the battery-pack slot, include two 3270 emulation cartridges, a 2,400-bps modem, an Ethernet local area network cartridge, an RS-422 high-speed serial port, and EGA/VGA graphics support.

The Halloween-motif screen easily outshines similar displays from competitors Compaq and Toshiba. Instead of washed-out orange on a background of even more washed-out orange, the GRiD screen presents brilliant orange, almost red, characters laid on a jet-black background.



The great contrast comes from an NEC-supplied AC plasma display. Most portable makers opt for a lower-cost, lower-contrast DC plasma display.

Part of what makes the machine so attractive—the slimline laptop design—also requires some compromises. The machine accommodates a 20MB hard drive and a 3½-inch floppy, but you need to use an external floppy drive to take advantage of the 40MB drive version. For \$350, you can buy GRiD's 1.44MB "pocket floppy"; the 1½-pound external unit plugs into the back and requires no extra power.

The biggest compromise? The keyboard. The small keyboard is good reason not to do too much typing with the GRiDCase; your wrists will get sore after creating even a short document. The Enter key is far too small, and the designers exiled the even smaller Backspace key to a far corner—an unwise decision considering how many errors you're likely to make because the keys are jammed so closely together. The toylike keyboard is jarringly out of place on a machine of such obviously high quality. GRiD does allow you to plug in other keyboards, though.

The GRiDCase has no separate numeric keypad, but you can con-

figure part of the keyboard to do double duty as one. Other keys asked to do more than one job include the F11 and F12 function keys and the PgUp, PgDn, Home, and End keys. On the other hand, all the keys have a smooth, sure feel, and they even spring back a bit to help speed typing. GRiD says that international keyboard software options can configure the keyboard to enter high-bit characters (ASCII 128-255) with little trouble.

Minor shortcomings aside, the GRiDCase 1530 is just the machine to leave on the chrome coffee table next to the Eames chair.

More than that, it packs a computing wallop and a stunning screen that will turn almost any desktop monochrome display green with envy. If you don't mind living with the tiny keyboard and can swing the hefty price tag, you can't do—or look—better using any other 386 laptop.

—Fredric Paul

**Shipley agrees, and dissents:** *You're right, the GRiDCase 1530 has the most dazzling screen of any*

**NEC's top-of-the-line offering gives you three AT-compatible expansion slots that you can easily reach through the top of the computer. The well thought out design gives you virtually everything you could want in a laptop at a (relatively) modest price.**





*laptop, and it does run (for a little while, anyway) on battery power. If the engineers at GRiD could get all that into a 7-pound package, they'd really have something.*

—Chris Shipley

### NEC POWERMATE PORTABLE SX First Chip on the Block

Look no further. If you want a lug-gable computer with 80386 power, incredible legibility, and a modest price tag, it's the NEC PowerMate Portable SX. The first portable computer built around the Intel 80386SX microprocessor, the NEC PowerMate combines a wealth of powerful features in a transportable package that's approximately the same size and weight as the Compaq Portable 386.

By using a 16MHz 386SX chip, NEC has been able to keep design and manufacturing costs low while offering the functionality of a 386. The design of the computer borrows heavily from NEC's 80286-based portable but adds a number of enhancements.

The NEC's target market, like that of the Compaq 386 portable, is professionals who need a full-function computer that they can move around or take home at night. Since the machine does not run on batteries, it's not designed for use in transit. And you probably won't want to spend much time lugging its 21 pounds around airports.

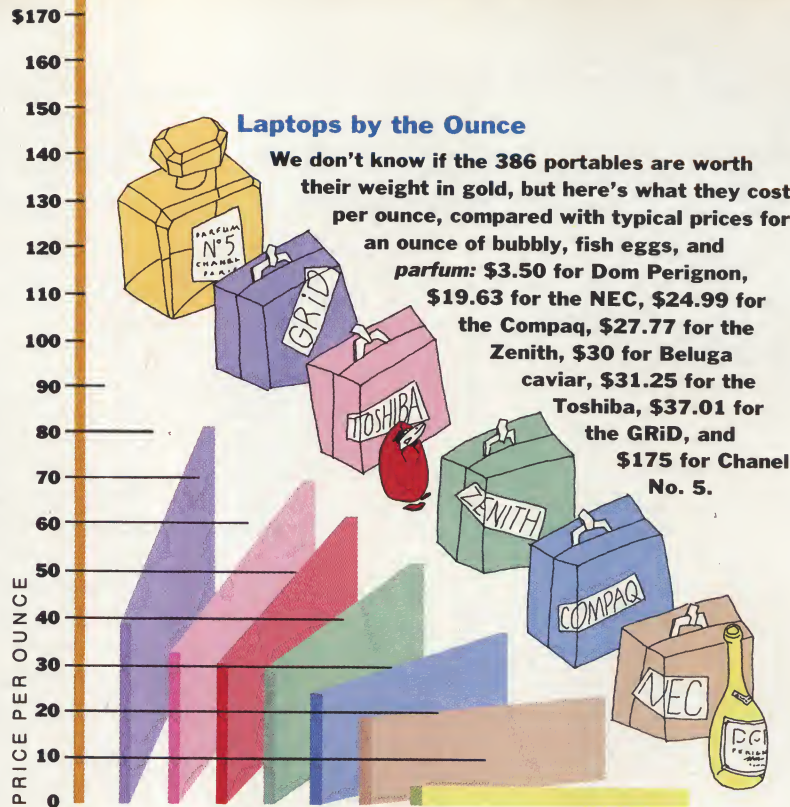
Although at first the size and the weight of the NEC make it appear intimidating, it begins to look more appealing once you discover the wealth of built-in features. To get the same features on most other portables, you need to buy cumbersome—and costly—external add-ons.

Available in only one configuration, the NEC includes a 42MB hard drive and 1.44MB floppy as well as 2MB of high-speed RAM. You can add up to 8MB more to the system board. The NEC features three full-length, 16-bit expansion slots, and you can get to them easily through the top of the computer. In addition, the PowerMate includes a universal keyboard socket and a 15-pin analog monitor output.

Like other portable

### Laptops by the Ounce

We don't know if the 386 portables are worth their weight in gold, but here's what they cost per ounce, compared with typical prices for an ounce of bubbly, fish eggs, and *parfum*: \$3.50 for Dom Perignon, \$19.63 for the NEC, \$24.99 for the Compaq, \$27.77 for the Zenith, \$30 for Beluga caviar, \$31.25 for the Toshiba, \$37.01 for the GRiD, and \$175 for Chanel No. 5.



machines in this price range, the NEC PowerMate Portable SX uses a gas plasma display. The screen appears similar to that of the Compaq and the Toshiba, but it supports an additional 80 lines of horizontal resolution. The 640-by-480-pixel screen can display EGA and VGA graphics in 16 shades of orange. The display looks good, but like other plasma displays, it doesn't show quite enough contrast for use in a bright office.

The few drawbacks of the internal screen quickly lose significance when you hook up one of NEC's MultiSync displays. The video adapter of the SX allows up to 800-by-600-pixel resolution on an external monitor. Even better, the display adapter can drive the internal and external monitors at the same time, a boon for anyone who needs to operate an external monitor or projection system.

This kind of flexibility is also evident in the design of the keyboard, which combines horizontal function keys with a numeric keypad positioned just to the right of the Enter key. The feel of the keyboard is light, but a reassuring mechanical click at the bottom of the stroke will comfort IBM keyboard devotees.

If you decide you'd rather pound away on a full-size keyboard instead of the portable's, just plug one into the DIN socket on the right side of the NEC. In fact, once you hook up your own keyboard and monitor, you can tuck the NEC under a desk and forget you're using a portable computer.

It's difficult to avoid comparing the NEC PowerMate Portable SX with the Compaq Portable 386. While the Compaq is a clear leader in raw performance, the NEC machine excels in every other area:

### NEC PowerMate Portable SX

**List Price:** \$6,595, including MS-DOS 3.3, BASIC, and Windows/386

**Dimensions:** 11 by 16 by 8 inches (HWD)

**Weight:** 21 pounds

**Display:** Gas plasma, supports 16-gray-scale EGA and VGA graphics

**Memory:** 2MB

**Disk Drives:** 42MB hard, 1.44MB floppy

**Options:** 5¼-inch floppy drive, \$495

NEC Information Systems  
1414 Massachusetts Ave.  
Boxborough, Mass. 01719  
508-264-8000



it has a better screen, accepts expansion cards in its main chassis, supports VGA graphics and 3½-inch floppies, has a vastly superior keyboard, and costs \$1,400 less.

—Doug van Kirk

**Gralla objects:** *OK, so they've put in everything but the kitchen sink. I still can't read the screen.*

—Preston Gralla

#### TOSHIBA T5100

##### No Traveler's Friend

Some people in the computer industry clearly believe that if you pack PC electronics into a VCR-sized package and slap a handle on it, you've got a portable computer. I am not one of them.

To me, portability is synonymous with "light-weight" and "battery powered." Laptop means "can be used on an airplane" and "no hand truck required."

So when my editor asked me to review a laptop for this issue, I said, "Give me the Toshiba," as I packed my briefcase for a trip out of town. Smart move, I thought: Toshiba has been making slight but capable laptops for years. Certainly the T5100 would follow in the tradition.

On the way out the door, I met the T5100—all 14 pounds, 8 ounces of it. I was a bit surprised. After all,

**The \$7,499 Toshiba T5100 features a fast 40MB hard drive, a 1.44MB floppy, and a 16MHz microprocessor that's second only to the Compaq's in processing speed. But the screen is only moderately readable, and the machine can run only on AC power.**

I had been traveling around with Toshiba's 6½-pound T1000. Actually, picking up the Toshiba T5100 is no real strain, but after about a half-hour in the Eastern Airlines ticketing line, carrying it became a bit wearing. Another 20 minutes in line and my shoulder began to ache.

My attitude toward the Toshiba took another dive when I tried to get through airport security. As usual, I passed the laptop to the security guard, walked through the metal detector, and revealed that I was transporting not contraband but an innocent PC. "Turn it on," the matronly guard grumped. To my chagrin, I had to crawl under the table to plug the sucker in. Laptops are *supposed* to run on batteries, I muttered, as I did my best to make a graceful exit from beneath the table.

Now, granted, I'm complaining about a couple of limitations that are counterbalanced by an otherwise attractive feature set.

Of course, the 80386 processor and 2MB of memory (expandable to 4MB) make this portable number as capable as any desktop PC. The chip runs at either 16 or 8MHz; some of my most sluggish on-the-road apps turned into real dynamos.

A 40MB hard disk of standard performance gives you plenty of room and disk access quick enough for heavy-duty, disk-intensive applications that turn an 80386 processor from an extravagance into a must-have.

I ran into an odd and seemingly unexplainable problem with the T5100's 1.44MB, 3½-inch floppy drive. It selectively refused to read some files written with a 720KB drive. It was a headache on the road, but once back in the office the glitch limited itself to two files, both perfectly readable on my home-based low-density drive. Odd indeed.

As displays go, the T5100 is no embarrassment. The orange on murky, darker orange display gives you 640 by 400 pixels of EGA-compatible graphics in four shades of gray (orange?) scale. It's not the GRiD, which sports a phenomenally crisp screen, but the T5100's gas plasma display is full-sized, without distortion, and generally readable.

(continued on page 102)

#### Toshiba T5100

**List Price:** \$7,499, including MS-DOS 3.3 and Windows/386

**Dimensions:** 3½ by 12 by 14 inches (HWD)

**Weight:** 15 pounds

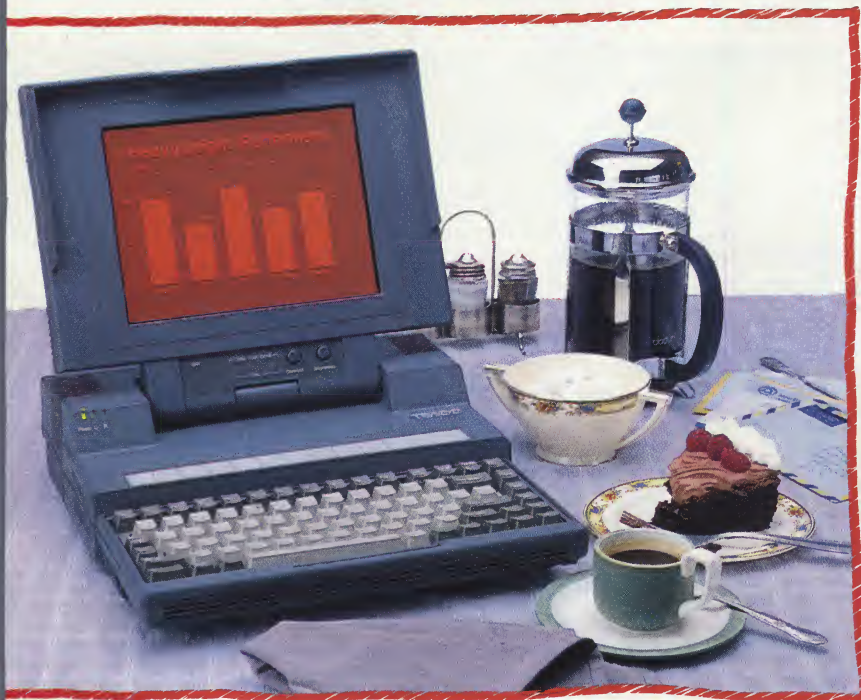
**Display:** Gas plasma, supports 4-gray-scale EGA graphics

**Memory:** 2MB

**Disk Drives:** 40MB hard, 1.44MB floppy

**Options:** 5-slot, 8-bit expansion chassis, \$1,000; 1,200-bps modem, \$400; external 5¼-inch 360KB floppy drive, \$500

Toshiba America, Inc.  
Information Systems Division  
9740 Irvine Blvd.  
Irvine, Calif. 92718  
714-583-3000





## On the Small Screen

From the orange glow of gas plasma to the brilliant backlighting of "page white" liquid crystal, the 386 laptop screens are the state of the art in portable display technology.

Portable screens have improved dramatically in the past two years. In contrast to the early days of transportable machines, computer makers must now choose between three flat-panel display technologies when they design a portable computer: liquid crystal, gas plasma, and electro-luminescent.

Liquid crystal displays, the most common, work by "twisting" or refracting light passing through the display to create light and dark areas on a piece of polarized glass or plastic. The effect is easy to demonstrate with two pairs of polarized sunglasses. As one pair is rotated in relation to the other, the amount of light passing through will vary from virtually 100 percent (minus the tint of the lenses) to almost no light at all. The LCD display works the same way, but it uses the liquid crystal material to refract the light relative to the polarized surface. It's actually the polarization of light that produces the screen image, not the crystals themselves.

These crystals are controlled by passing electric current through them. Two transparent electrodes on either side of the liquid crystal material are positioned at right angles to each other to form a matrix. Each point of intersection becomes a pixel, or screen element, that the computer can control. When a current is applied, the crystals turn, refracting the light.

Unfortunately, since each electrode must serve either 400 or 640 pixels, only a small amount of current is available to serve an individual pixel. As a result, the crystals turn slowly, producing only moderately sharp contrast. But when liquid crystals are energized in the small

display of a watch or calculator, each segment of liquid crystal material has a dedicated set of electrodes. That way the crystals are more fully energized, and the result is sharper contrast and a faster response time.

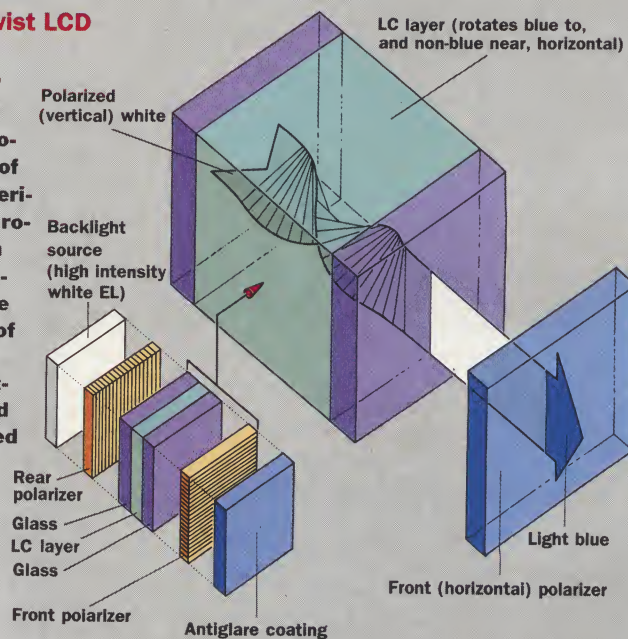
Clever engineering can make up for many limitations, though. In fact, the Zenith TurbosPort 386 demonstrates just what LCD technology can achieve. The TurbosPort's "page white" display has an additional layer of glass, called a

While this method will yield both a high degree of contrast and a fast response that eliminates ghosting, it will be costly, since a typical screen will require 256,000 transistors.

This screen technology (dubbed "active-matrix thin film transistor" by display developers) will not only add more contrast to monochrome displays, it will make color LCDs a reality for high-end laptops. It may also eventually find its way into consumer electronics.

### Backlit Supertwist LCD

**In a "supertwist" display, polarized light is twisted (rotated) by a layer of liquid crystal material. The degree of rotation depends on the amount of current applied to the LC. The twisting of light rays causes light and dark patterns when viewed through a polarized layer of glass or plastic.**



neutralizer. The neutralizer filters the light to produce blacker characters on the screen. This display shows better contrast, but it requires a brighter and more expensive backlight.

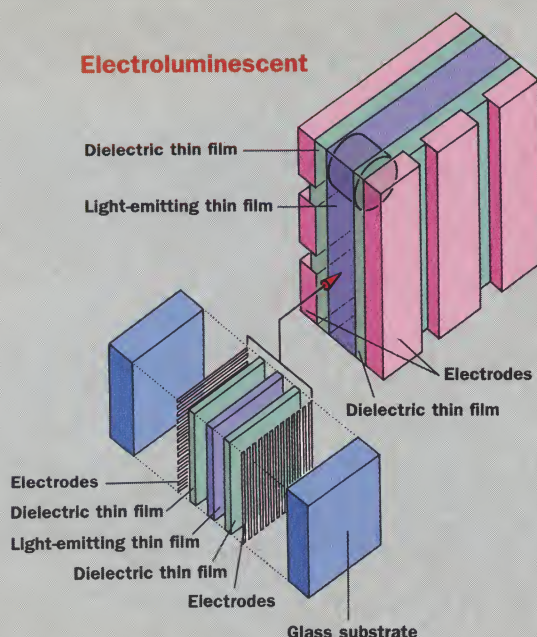
Industry leaders in LCD development insist that the next generation of displays will show dramatic improvements over today's screens. Future screens will replace the matrix of electrodes used to energize the crystals with transparent transistors deposited on the glass. Each pixel will have its own transistor to switch current to the electrode.

But until this technology becomes available, the display of choice for a portable is likely to remain gas plasma. Because plasma displays light their pixels 50 times faster than LCDs, they're a good match for the high-speed electronics of a 386 portable. Cost and power consumption are usually not design issues in this class of performance-oriented computers.

Unlike an LCD, the gas plasma display does not require a light source for viewing. Instead, thousands of individually controlled light sources create a screen image. The



## Electroluminescent



**The electroluminescent (EL) display uses a solid material (zinc-sulfide doped with manganese) that glows when an electric current is passed through it. The material is deposited directly on the viewing glass, producing a lightweight, one-piece display screen.**

plasma display, like the liquid crystal display, contains electrodes above and below the gas. Current flowing from one electrode to another excites neon gas, causing it to glow.

One of the plasma display's crucial limitations is its inability to show sharp contrast. A plasma display pixel cannot be partially lit, as a CRT can; the gas is either energized or it's not. Displays that show varying contrast levels do so by turning off alternate pixels or by rapidly modulating pixels.

Manufacturers are busy developing color plasma displays. Their prototypes use an ultraviolet light-generating gas to excite colored phosphors on the surface of the screen. But designers must resolve many problems before this technology is available to consumers.

You won't have to wait long, though, for another flat-panel technology that promises to challenge gas plasma for leadership in the high-end display market. Electroluminescent (EL) screens combine the contrast and brightness of top-of-the-line plasma displays but use only as much power as typical backlit LCDs. What's more, they'll be available in several portables in 1989.

Instead of a glowing gas or light-bending crystal, an EL screen uses a

thin film of solid material (zinc-sulfide with manganese) that glows in response to electric current. Because the material requires no containment, manufacturers can produce the display using only one piece of glass. So the EL screen weighs less than plasma or LCD screens. Modest electricity requirements make

EL displays suitable for use in battery-operated portables.

Although EL technology has been around for a while, it has yet to be used in mainstream portables, partly because manufacturing techniques for the current generation of screens have only recently produced acceptable yields. In addition, early EL screens showed only medium contrast and had a tendency to "burn" characters into the screen when users left them on the display for long.

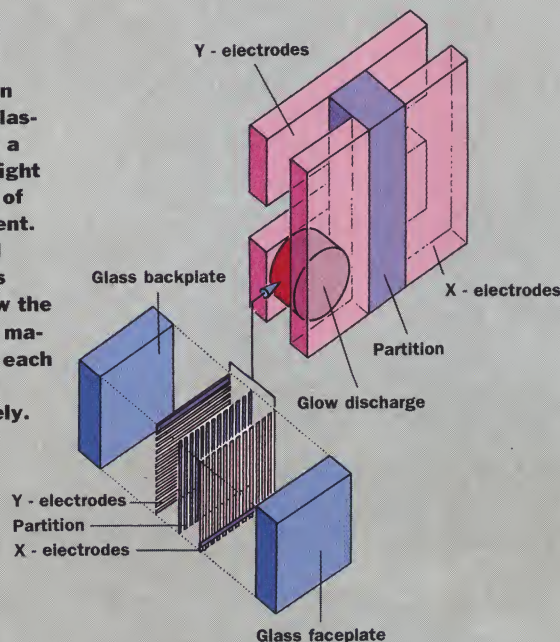
Both these problems have been solved, according to Planar Systems of Beaverton, Oregon, a leading EL manufacturer and one of the few U.S. firms developing display technology. Planar screens can produce a contrast ratio of 60 to 1, five to ten times greater than plasma displays can produce. Like LCD and plasma, EL seems poised on the brink of color. Planar has shown a color EL screen and claims it will have a color screen available in the early 1990s.

The revolution in display technology is approaching fast. Color screens are only two to three years away, and high-contrast monochrome screens will begin appearing in 1989.

—Doug van Kirk

## Gas Plasma

**Similar to a neon light bulb, the plasma display uses a gas that emits light in the presence of an electric current. Like the EL and LCD, electrodes above and below the material form a matrix that allows each pixel to be controlled separately.**





## The Toshiba T5100 transformed some of my most sluggish on-the-road applications into real dynamos.

(continued from page 99)

I've wrestled with some laptop keyboards that seemingly cater exclusively to tiny preadolescent hands and make even the most graceful typists feel like clods. By comparison, Toshiba did a fair job with the T5100. The compact, 82-key keyboard takes a little getting used to until you learn to modify your reach, but once you get a feel for the touch and clatter of the plastic keys you can fly along pretty easily.

If you want to move beyond standard equipment (which alone will put you back \$7,499), Toshiba is glad to outfit you with either a 2MB LIM/EMS or an extended memory card, an internal 1,200-bps Hayes-compatible modem, an external 5¼-inch

floppy drive, a five-slot expansion chassis with interface cards, and, of course, a handy carrying case.

But for all its features, the T5100 is still no traveler's friend. Toting it around airports will wear you out, and once you get where you're going, you'll need to rearrange your hotel room to find a suitable AC outlet.

If it would only lose weight and cut the cord, this Toshiba would make its family proud.

—Chris Shipley

**Van Kirk argues:** *The T5100 has a great keyboard, EGA output, a decent screen, and 386 power in a 15-pound package. And you can't blame Toshiba for au-*

### Test Your 386 Portable Personality

Since all the machines we reviewed are top-notch 386s, sometimes the choice of which machine to buy—if you *must* have a 386 portable—comes down to personality. What follows is a tongue-in-cheek look at the ideal buyer's personality profile.

**Compaq Portable 386:** You buy super-high-test and can't resist screaming down the highways and byways when you can find the time. You're Type A, and everyone knows it. The fastest portable, one that won't let you down: that's what you're looking for. You want it on your desk at the office and in the field, and at home or in your hotel room. Forget about taking notes or writing on planes and trains; you do heavy-duty number crunching in one place at one time. You like power, and you don't care how much it costs. You want the Compaq.

**GRiDCase 1530:** You've climbed Kilimanjaro, skied the Rockies, driven through Tuscany, fished in the Adirondack lakes, explored the tombs of the Nile's West Bank at Luxor, cheered for your team in Seoul, sailed the Bay

of Fundy, tested the room service of the Ritz—or you've wanted to, even though you're stuck 197 miles from Dubuque in your engineering firm's field office. You want a GRiDCase. Just don't expect to wander more than a few hours from an electrical outlet or a battery charger. And remember, you could take a trek around the world for what the GRiDCase will set you back.

#### **NEC PowerMate Portable**

**SX:** The practical yet trendy type [read yuppie], you drive a Volvo (well, maybe a Saab), have 2.5 kids, 2.5 homes, and can't get enough of your work—at home, in the field, and at the beach house. You wanted the Compaq—until you saw how easily you could hook up an external monitor and keyboard to the NEC. After all, NEC hypes its 386SX machine—the least expensive of the five reviewed here—as the “desktop computer for people whose minds are at work even when their bodies aren't.” Isn't that you? It's the baby boomer of the 386 portables.

**Toshiba T5100:** You can never be too powerful or too thin, as the

ad says. You're an account exec or movie mogul, or a sales rep with a rich fantasy life. You loved the slimline T1000 but wanted more. Your insatiable desire for power, your love of things dark and inscrutable, your need to impress your fellow travelers on the red-eye to L.A. or the Concorde to London town, your taste for sushi—all this leads you inexorably to the Toshiba. It's a good thing that it has what it takes to run your financial spreadsheets.

**Zenith TurbosPort 386:** You work for a Big Eight accounting firm. Some people might call you boring, but you know better. Clad in one of your blue pinstripes, some days you're auditing the books at an insurance company in Portland, others you're back at the home office in Boston; then it's off to Manchester. With audit plans and proposals to get out, financial results to plot, and SEC reports to file, you work 60 or more hours a week. You plan to make partner next year, and you'll be laughing all the way to the bank. You need the Zenith to make it happen.

—Carol Olsen Day



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thoritarian airport security guards.

—Doug van Kirk

### ZENITH TURBOSPORT 386 Sharp Vision, Heavy Power

The Zenith TurboPort 386 has a clam-shell design, a battery, and an optional built-in modem. But don't be fooled. It may walk like a laptop and quack like a laptop, but at 18 pounds with its battery, plus a couple more for its outboard AC power supply, it's definitely a Baby Huey among the ducklings.

What the TurboPort really is, like many of the 386 portables, is a relocatable machine that supplies desktop-PC-class computing power for a user with more than one desktop—work and home, or his own office and a client's. And the Zenith TurboPort 386 is one great relocatable.

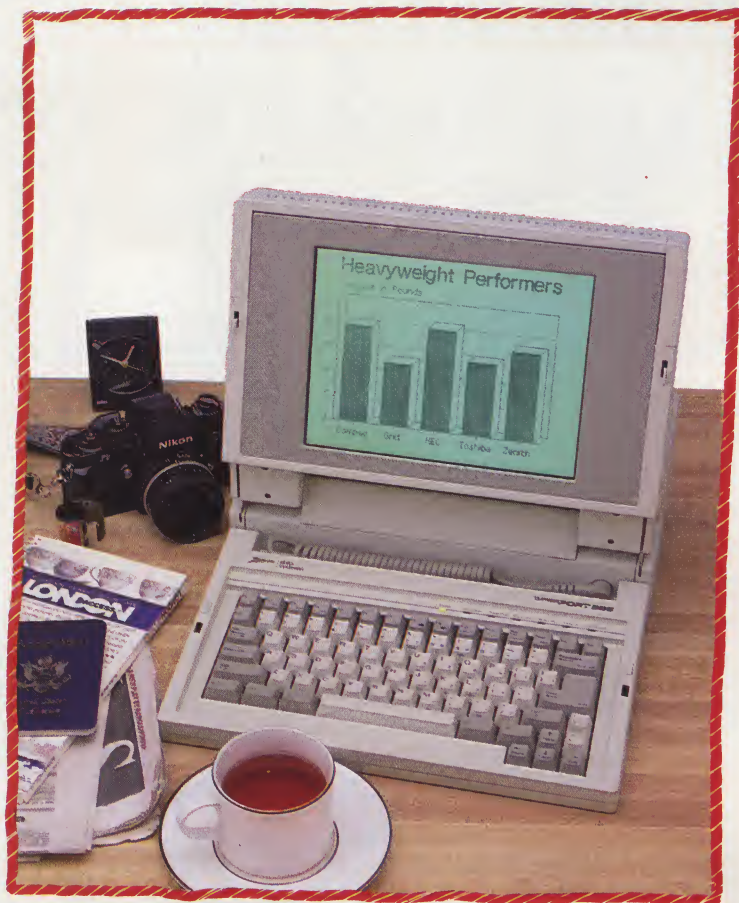
What makes it so good is its screen. The screen is a so-called "page white"—black characters on a brilliant (pearly gray, if not exactly white) background. It uses two liquid crystal displays stacked one on the other and backlit by a flat fluorescent light. The screen resolution (officially 640 by 400 pixels) is top-notch, and its contrast is even better. Judging the winner in a side-by-side test with a multisync monitor running off an EGA card is a tough call.

The keyboard is as bad as the screen is good. The computer's narrow case is 15 inches wide, not wide enough for a usable keyboard. The 79 keys are made to do 101-key duty with a function key that doubles up on what many of the other keys do.

The keyboard comes in the form of a plastic tray that has a raised lip and a heft reminiscent of the seat-

back trays on a particularly cramped airplane. Touch-typing is surprisingly easy, considering that the keyboard's size and raised edge create the sensation that you're typing in an ashtray.

A springy coiled cord lets you pull the keyboard a good three feet away from the unit. But the keyboard is so light that if you pull it out too far, the cord will jerk it right back. And when you



**The Zenith TurboPort's page-white screen has outstanding contrast and readability. The built-in battery gives you more than two hours of remote operation, but at 18 pounds, it's really too heavy to use as a laptop.**

#### Zenith TurboPort 386

**List Price:** \$7,999, including MS-DOS 3.21

**Dimensions:** 13 by 15 by 5 inches (HWD)

**Weight:** 14.6 pounds; 18 pounds with battery

**Display:** Backlit LCD (page white), supports CGA graphics

**Memory:** 2MB, zero-wait-state

**Disk Drives:** 40MB hard, 1.44MB floppy

**Options:** 2,400-bps modem, \$499; 3-slot, 8-bit expansion chassis, \$449

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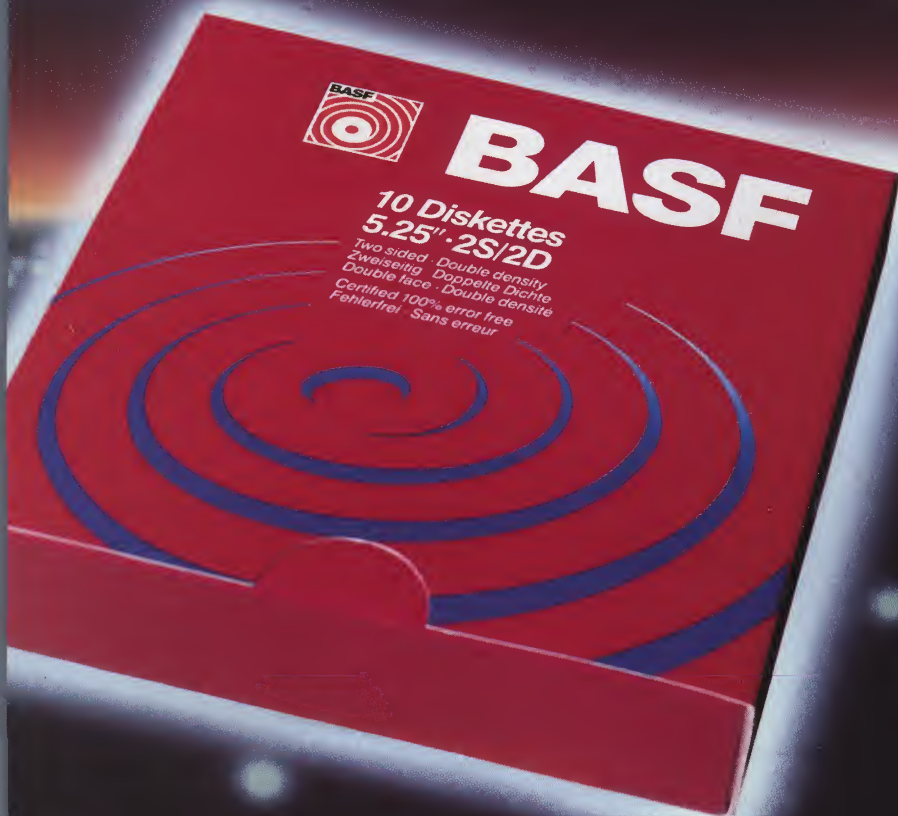
detach it from the system box, it dances all around the desktop—particularly if you've swung out its tiny legs to set the keytops at a slope.

With a top clock speed of 12MHz, the Zenith isn't the screamer that the Compaq is, but it's noticeably faster than a typical 286 when working on Lotus 1-2-3 and doing other processing-intensive tasks. Zenith has clearly aimed the TurboPort at the CPA market. Its 42MB hard disk is big enough for lots of data, the expanded memory gives it real spreadsheet power, and there's a port for an optional number pad.

Word processing programs don't look quite as good as 1-2-3 on this machine, mostly because the monochrome display doesn't deal well with the colors, shadings, and reverse video modes that some programs use to indicate the status of text.

You can use the video connector on the back of the machine to attach a color monitor, but you probably won't need to do so often. The high resolution of the backlit display makes the low-resolution CGA that the TurboPort generates on an external moni-





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tor look like finger painting.

The TurbosPort's major disadvantage, strange as it may seem, is its battery power. The battery works just fine—for at least two hours when you're doing disk-demanding work—but it adds weight and bulk. That's the problem: because the built-in battery takes its place inside the machine, the AC power supply is separate. Besides the main machine, you must also shoulder the power supply unit, in the form of an ivory plastic brick with a cord extending from each end. What a drag.

Yet the TurbosPort's size means it will never really be used as a true laptop. Besides, who wants to risk perching on his knees a fragile technological marvel that costs more than a small car?

Zenith should take a closer look at the TurbosPort's true identity as a relocatable, not a laptop. It might find that trading battery operation for an in-board power supply, would, like confession, be good for the soul of its new machine. —David DeJean

**Paul takes issue:** *I like black-on-white screens, too—in theory. But I wish you could see the TurbosPort's screen when you're not sitting directly in front of it. Move about 30 degrees off-line and the characters dissolve into a blue haze. Even from right in front, the cursor is practically invisible.* —Fredric Paul

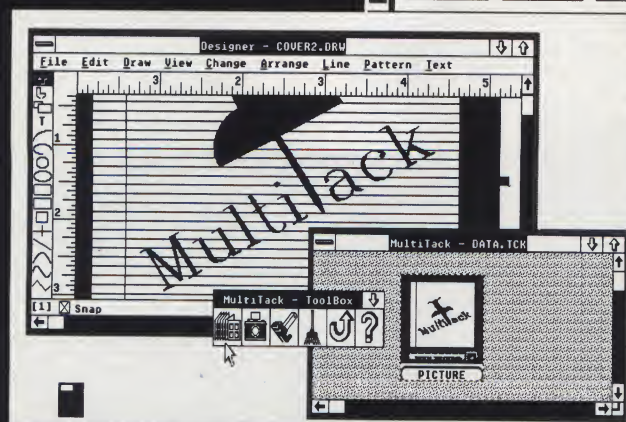
### The Reviewers

**David DeJean** is a senior editor of PC/Computing. He could have used the power of a 386 portable, but not the weight, as he traveled the country to talk with the medical front-runners featured in our September cover story, "Hope and Glory: Men, Medicine, and PCs." **Preston Gralla** is departments senior editor of PC/Computing. He plans to send his optometrist's bill to the makers of 386 portables after spending hours staring at their screens. He coauthored this month's cover story on OS/2. **Fredric Paul** is a senior editor of PC/Computing. As he makes clear in this issue's Next department, he considers even laptop computers to be far too big. **Chris Shipley** is PC/Computing's senior editor for New! She lugs a laptop thousands of miles a year and won't be satisfied until a full-featured portable weighs less than 5 pounds. **Doug van Kirk** is an associate editor of PC/Computing. Although he gets by with a Toshiba T1000 on the road, he madly seeks the status of a GRiDCase 1530.

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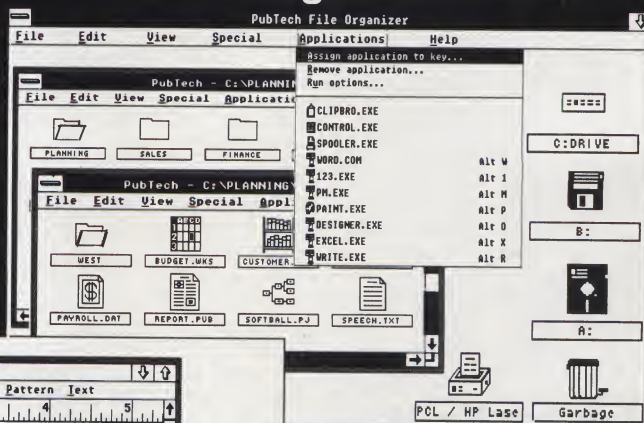
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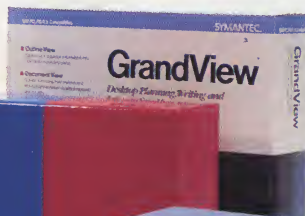
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## SPECIAL REPORT

# Why Japan Can't Write Software

**The Japanese excel at producing hardware, but the world's software is born in the U.S.A.**

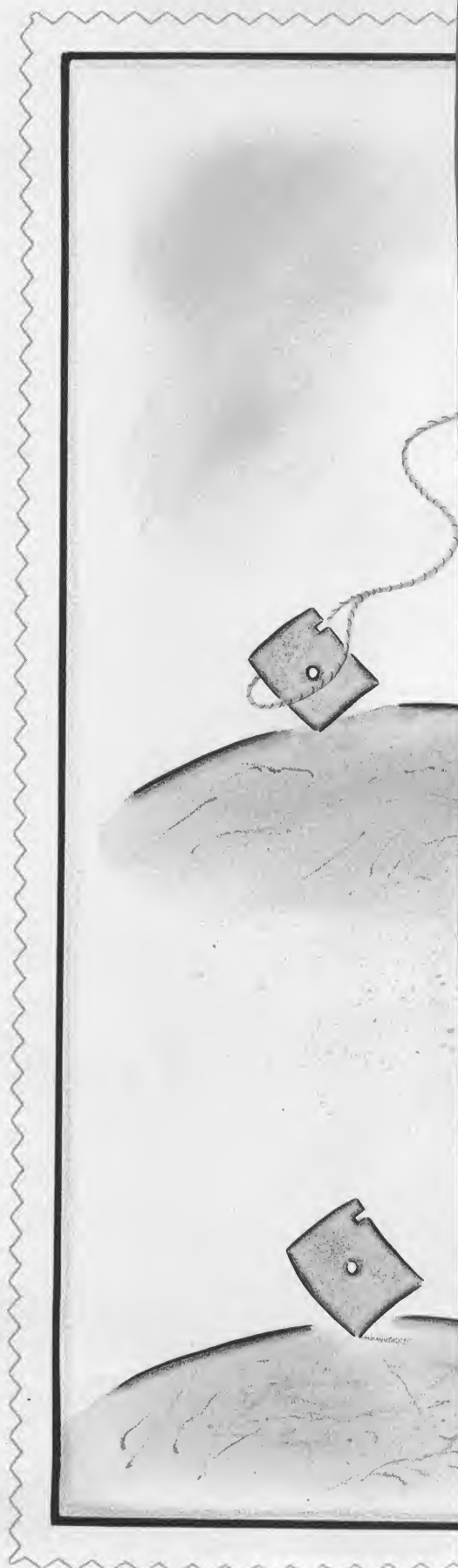
**By CAROL ELLISON**

Americans have become accustomed to driving Toyotas and watching the evening news on Sonys. We build ships and skyscrapers with Japanese steel and assemble computers from Japanese microprocessors. In the personal computer industry, the letters NEC stand nearly as tall as IBM, and the name Sony shines brighter than Princeton Graphic Systems.

Yet Japan remains virtually invisible in the PC software business.

Japan may dominate the hardware markets, but software remains as American as Bruce Springsteen and Lake Erie lampreys. All of the world's leading PC operating systems have an American lineage. DOS is the property of Microsoft and IBM, Apple owns the Macintosh Finder and MultiFinder, and

ILLUSTRATION BY ALEXA GRACE









Unix is the brainchild of AT&T. Among applications, Lotus 1-2-3 reigns as the worldwide spreadsheet standard. Ashton-Tate's dBASE rules the database market. MicroPro's WordStar claims the world's largest installed base among word processors, with Orem, Utah-based WordPerfect commanding the highest sales.

In PC software, the masters of export can't even hold on to their home market. Lotus 1-2-3 dominates spreadsheet sales in Japan; its next closest competitor is Microsoft's Multiplan. dBASE is far and away Japan's top-selling and most widely used database.

The only part of the Japanese applications market controlled by domestic companies is word processing. Ichitaro, from Just System, and Supper Shunbou, from dB-Soft, top the charts in Japan.

Takefumi Kanoya, general manager of the Japan

*Carol Ellison, a senior editor of PC/Computing, professes a special fondness for sushi and music by Tomita. Her Japanese hardware—a 1979 Datsun pickup and a 1972 Sony TV—is still running strong.*

Personal Computer Software Association (JPSA), asks, if Japanese software houses "can't get the market share in Japan, how could they bring it to the United States?"

### What's the Problem?

Japanese companies have had trouble developing business software for personal computers largely because the Japanese people's language and culture lead them to deal with PCs in a very different way than Westerners do.

First, it's difficult to convert the Japanese language into electronic form. And most Japanese offices are radically different from their Western counterparts, using PCs sparingly if at all. In addition, Japan's hardware manufacturers have failed to adhere to industry-wide standards, fragmenting the market and creating a software distribution system characterized more by bundling and customization than by off-the-shelf sales.

Just as important, Japanese culture emphasizes conformity rather than the entrepreneurial spirit that

## Selling 1-2-3 in Japan

A full-page thank-you advertisement in a September edition of *Nihon Keizai Shimbun*, the Japanese equivalent of *The Wall Street Journal*, saluted the market that had made America's favorite spreadsheet number one in the Land of the Rising Sun.

The Japanese version of the Lotus Development Corporation's 1-2-3, Release 2.1, had hovered at the top of Japan's spreadsheet sales charts all year, had won the Software of the Year award from *Nikkei PC* magazine, and had now surpassed the 100,000 sales mark. Its rise to the top was an occasion worth celebrating, and Lotus Japan did so in traditional Japanese style—by honoring those who put it there.

No doubt 1-2-3's status as a worldwide standard in business applications software had much to do with its success in Japan, but its phenomenal ascendancy from concept to market predominance is a dramatic lesson in effective marketing and cultural transitions. In addition, the thank-you ad exemplifies Lotus's understanding of the subtleties

of the Japanese market.

The Japanese 1-2-3's road to the top began in November 1984, when a three-member fact-finding team from Lotus flew to Tokyo to assess the Japanese market. The rising

ready beaten out the top-selling spreadsheet in Japan at the time (Microsoft's Multiplan) convinced Lotus execs that the time was right to introduce the Japanese to 1-2-3.

A development team headed by Steve Turner, who also supervised European product development for Lotus, went to work to translate 1-2-3 into Japanese, adapt its Western single-byte character structure to the Japanese double-byte character set, port it to the many different types of personal computers used in Japan, and add features to "Japanize" the product.

For two years, Lotus worked closely with Soft-Bank, Japan's largest software distributor, on the design and marketing of the new version. Only

then was the company ready to take the new 1-2-3 to the market.

"We knew we could not make much of an impact in the market un-



Lotus updated a historic Japanese photograph to help sell 1-2-3 in Japan.

sales of 16-bit, AT-class machines, the growing demand for business application software, and the fact that in other markets 1-2-3 had al-



built America's great software houses.

One thing that clearly *isn't* responsible for the Japanese absence from the software market is an inability to write code. Japan's convincing success in writing and selling computer games proves that America has no monopoly on talented software designers.

Pac Man, for example, had the American young and young-at-heart plugging quarters by the millions into video machines during the late 1970s and early 1980s. The colorful little glutton originally came to our shores from Japan as a standalone video arcade system; it also enjoyed significant success as a game cartridge for home video machines and in floppy disk form for all types of personal computers.

Like Pac Man, adaptations of Japanese video arcade hits tend to do better here than programs originally designed for personal computer use. But Japa-

nese game designers have had some success in the U.S. PC market. In Japan, the ASCII Corporation sold more than 400,000 copies of a strategy game

The screenshot shows a spreadsheet with the following columns (from left to right): 会社名 (Company Name), 売上 (Sales), 利益 (Profit), 株当たり (Per Share), and PER. The data is presented in Japanese characters. The spreadsheet is titled '株主一覧表' (Shareholder List Table) and includes a date '88-07-08' and a time '11:38 PM'.

Programs that can handle Japanese characters, as in this screen from the Japanese version of 1-2-3, must use a complicated double-byte character set.

less there was a quantum leap in ease of use," says Jack Plimpton, the Lotus marketing manager who opened the Japanese office.

"Lotus 1-2-3 was known worldwide, a very high-visibility product," says Yasuhiko Ohmori, chairman and CEO of SoftBank. "What we had to do was make Lotus better graphically in the Japanese market, to conduct an effort at localization without losing the 'Lotusness.'"

Lotus established a Tokyo office, hired a Japanese staff, and succeeded in wooing Saburo Kikuchi away from his job as a leading executive of the Sony Corporation to become president of Lotus Japan.

To the Western version of 1-2-3, Lotus added a kana-kanji language conversion routine developed by its Japanese technical partner, Kanri Kogaku Kenkyusho, more conveniently known as K3. The conversion program operates as a pop-up routine within 1-2-3 and allows users to transform phonetic phrases—typed in Roman letters at the keyboard—into Japanese characters onscreen.

Other new features included Japanese-language menus, help screens, manuals, and a menu tree; mouse

support; an onscreen function-key template; a learn mode; an electronic tutorial and disk manager similar to those in 1-2-3, Release 1A; Multiplan file-conversion abilities; a choice of eight types of grid lines; user-selectable onscreen colors; the ability to select print attributes such as bold and double-height letters using 1-2-3's Range command; new @ (at) functions to meet the needs of the Japanese market; and the addition of Japanese chart types.

But to any Western user who's complained about 1-2-3's rudimentary and cumbersome graphics routine, the most dramatic change was the addition of a high-quality graphing function that users could access from within the program. Release 3 of 1-2-3 will incorporate a similar improvement.

As Lotus proceeded with the technical Japanization of the spreadsheet, a uniquely Japanese marketing scheme was also coming together. Because Japanese consumers often base their software purchase decisions on the number of instructional and help books available for a product, Lotus contracted with eight authors to produce Japanese-language books on how to use 1-2-3.

The books were written, printed, and waiting on Japanese bookshelves before the Japanese version of 1-2-3 began shipping.

Lotus also launched an advertising campaign on Japanese subways, something never before attempted for a software product. The ad recreated a historic Japanese photo taken in the mid-1850s, as Commodore Matthew C. Perry opened Japanese markets to the West—adding a Victorian-looking gentleman humbly offering a floppy disk.

Within a month of its September 1986 release, the Japanese version of 1-2-3 had raced to the top of the spreadsheet sales charts.

Even more than the effectiveness of the marketing plan, says Ohmori, Lotus's sensitivity to the Japanese way of conducting business and its demonstrated willingness to make a long-term commitment to the Japanese market accounted for its success there.

"An outstanding factor," he says, "was that [Lotus president] Jim Manzi had spent two years in Japan [as a management consultant for McKinsey & Company] before coming to Lotus and actually knew Japan from his heart."

—CE



called Soko-Ban, originally designed for the Japanese MSX-system computers. Spectrum HoloByte, a computer games company located in Alameda, California, purchased the license to market Soko-Ban here and rewrote the code, porting it to IBM, Apple, and Commodore personal computers and adding features to adapt it to the U.S. market. Spectrum HoloByte released the game in the United States early this year; by mid-September, with company officials still looking forward to the Christmas season, sales had topped 50,000 units.

So far, however, Japan's export software successes have generally been limited to games. "When dealing with companies in our country about taking their products overseas," says Kanoya, "99.9 percent of our consultation is for games. The games tend to convert [to English-speaking markets] quite well, but the business applications have a difficult time."

That may be because the games are better products to begin with. Japanese consumers demand superb graphics, and video systems on Japanese PCs achieve much higher resolution than do U.S. systems. Not surprisingly, games arrive on American shores as attractive, high-quality products.

Some Japanese business programs that have been domestically successful have attempted to buck the odds and make the transition to the U.S. market. In 1985, for example, Japan's Stella Systems decided to market its top-selling graphics program in the United States. The company sent the program to an Indian

software house to be translated into English and ported to the IBM PC.

Stella Business Graphics was released in the United States in December 1986, marketed by a wholly owned American subsidiary also called Stella Systems. In April 1987, after a modest success, Stella Systems of Japan sold the American subsidiary to its local president, Don Johnson. This past summer, Johnson sold the rights to Brown Bag Software of Campbell, California.

Computer-aided design software from Japan's Dynaware also enjoyed some niche-market successes in the United States, but no Japanese business program has yet posed a serious challenge to its American competitors.

The problem may be the elaborate translation and Americanization required for business programs. Since games communicate graphically, with a minimum of text, they don't need all that extra work.

Or it may just be that game products make the cultural transition more easily than work-related software. Business norms are closely tied to national cultures, while fun is, well, *fun*.

### The Language Barrier

Until recently, the biggest problem facing Japanese software developers was how to put the Japanese language into electronic form. Japanese writing is an amalgam of words and characters borrowed from other languages. Only about 100 of the thousands of characters used in Japanese writing are derived from the country's native phonetic katakana and hiragana scripts. The rest consist of Roman, Greek, and Cyrillic letters, and thousands of ideograms that were adopted from the Chinese more than 1,000 years ago. Japanese, as a language, is a testament to the cultural flexibility of the Japanese people. It is also, however, a programmer's nightmare.

That's one reason why Japanese business communication, even today, is largely handwritten. Fax machines were a godsend to the Japanese, because their script is so tough to represent on word processors and computers. For years, Japanese typists performed their work on unwieldy keyboards more difficult to master than an electronic synthesizer.

English-language text is represented with various combinations of 26 Roman letters, making it relatively easy to map into the standard ASCII character set, which originally used 7 bits of an 8-bit byte to represent each of 128 characters. IBM, in adapting ASCII for use on the PC, doubled the number of characters in the set and used a full 8-bit byte to represent each

**Takefumi Kanoya, general manager of the Japanese Personal Computer Software Association, says his government is only now turning its attention to PC software development.**



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one. IBM's 256-character ASCII set now reigns as the standard for personal computers in the United States and Europe.

But IBM's ASCII is far too limited to accommodate the 60,000 characters of written Japanese. The ASCII set can't even come close to handling the set of some 3,000 characters that the Japanese Institute of Standards (JIS) identifies as essential for business communications.

The problem is gradually being solved. By 1984, Japanese hardware firms were designing their equipment around a double-byte, 16-bit system that supported the JIS standard. Since then, major Japanese hardware firms have added capabilities to deal with thousands more characters, and today most word processors and computers can handle a standard set of up to 7,000 characters. The Japanese have borrowed a number of Western words and phrases in their language, so Japanese PC software must also accommodate the single-byte characters of the ASCII set used in IBM PCs.

#### **A Different Office**

Adoption of linguistic standards by the JIS freed Japanese programmers to develop business applications for their own national market, but most chose to concentrate on software for mainframes and dedicated word processors. Of the 6,600 companies that develop software in Japan, only about 1,500 write code for microcomputers, and microcomputer programmers tend to be paid less than software engineers who design for mainframes and minicomputers.

Although more than 5.5 million personal computers have been sold in Japan, Japanese offices use personal computers very differently than Western offices do, which helps to explain the different status accorded PCs.

To the American observer, Japanese offices are reminiscent of a 1950s steno pool. There are no plants, no pictures on the walls. There are, in fact, very few walls. In a country where real estate is scarce and Tokyo rents make midtown Manhattan seem cheap, managers and subordinates alike often work two to a desk in large, open office areas.

Standalone word processing systems continue to be the productivity tool of choice in Japan, while personal computers often sit in corners—on tables next to fax machines and copiers—rather than on individual desks. Up to 20 people may use the same machine. A Toshiba executive once described micros in Japan as “not workstations, but walk-stations.”

Keyboards of any kind, whether they belong to computers or word processors, tend to be found only on the desks of clerks, secretaries, and front-line managers. Most older Japanese executives still don't recognize the personal computer as a valuable management and communications tool.

Even Japanese homes, bastions of electronic gad-

getry, have not embraced personal computers. Japanese consumers find it difficult to master the American-style Qwerty keyboards on most PCs, so dedicated game systems from companies such as Sega and Nintendo, which don't rely on the keyboard, have captured much of the home market.

#### **The BIOS Battle**

The Japanese personal computer market is concentrated in large multinational corporations. A recent JPISA survey of personal computer use in Japan showed that 73 to 80 percent of small-to-midsized businesses don't own a single personal computer.

Despite the concentration on large users, the market is as fragmented as the view through a kaleidoscope. The same Japanese manufacturers that

**The Japanese have a lot of catching up to do in software, but they were once way behind in cars, stereos, and computer chips, too. The country is beginning to target the software industry, and U.S. companies can't feel too smug.**

readily cloned the IBM PC standard to produce machines for export to the United States declined to embrace that standard in the equipment they produce for their domestic market.

Although NEC dominates the market, Japan's other 120 to 150 personal computer manufacturers each use a proprietary BIOS, or basic input/output system. Though most Japanese personal computers are built with the same 8088, 80286, and 80386 chips that power U.S. machines and run under various versions of MS-DOS, applications written for one machine must still be ported to the others because of BIOS differences.

That holds true even within companies. NEC's 9800 computer, the market leader, can't read files created on the company's 8800 model. And IBM's own entry in the Japanese personal computer market, the 5500, isn't compatible with IBM PCs marketed in the West.

The NEC 9800's large market share—50 to 80 percent, depending on whose figures you believe—makes it the closest thing in Japan to a personal computer standard. (Fujitsu is next.) However, NEC has shown no willingness to license its BIOS to other manufacturers and last year hauled Epson into court when it attempted to market a 9800 clone.

In Japan, PCs and ATs as we know them are typically found only in two places: software houses





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## Toughing It Out on U.S. Soil

▶ You'd never guess from a quick glance at the software shelf in the local computer store, but the United States isn't the only country that writes PC software.

Countries throughout Europe and Asia, not to mention Australia and the Americas, support active, if relatively small, PC software industries.

The problem is that no matter how good a foreign software product may be, a foray into the U.S. market requires large investments in both marketing and research and development. It also calls for at least a rudimentary understanding of American business culture.

That's one reason why competitors in the small but thriving European software industry are generally satisfied to sell only in their local markets.

American companies, for their part, often overlook software written outside U.S. borders. They may exploit programming talent in Europe, India, and the Far East, but they don't often see these regions as sources of new, innovative programs.

Despite the difficulties involved, however, the huge U.S. software market remains a tempting target, and more than a few foreign companies have had some success over here. Mexico contributed DacEasy Accounting, for example, while Bedford Integrated Accounting was written by a Canadian construction manager who couldn't find the right software to manage his small business.

Sometimes foreign origins can actually help a software product. Dutchman Vincent Everts moved to the United States in May to develop a dealer and distributor network for The Flying Dutchman, a file transfer program, and Auto-Manager, a low-cost program for tracking AutoCAD drawings.

Everts says the programs' Dutch heritage is a surprisingly useful sales tool. "Americans are roman-

tic," he says. "They're always wanting to know more about Holland."

The energetic and savvy 29-year-old Everts spent several weeks establishing an office in Atlanta and learning the U.S. mail and telephone systems before launching an all-out sales campaign. "With software," he says, "it's the inspiration that counts and the enthusiasm with which you market it." He's already lined up 270 AutoCAD dealers to distribute his programs and has set his new goal at 400 outlets.

Other foreign companies play up their national history at their own risk. Adaptive Electronics of Melbourne, Australia, for example, got itself into hot water by assuming Americans would understand Australia's cultural heritage.

Adaptive received rave reviews at the fall 1986 Comdex trade show for a demo version of its sales prospecting program, Tracker. To capitalize on the initial success, company representatives hatched a marketing campaign linking the product to Australia's aborigines, who are known for their sophisticated hunting and tracking skills. The package's cover and disk jacket featured a color photo of a loin-cloth-clad aborigine clutching a spear and gazing into the outback.

When Tracker made its official U.S. debut four months later at the West Coast Computer Fair, the packaging attracted the wrong kind of attention. "People thought it was some kind of Australian bush game," sighs Mike Buckley, vice president of the company's U.S. subsidiary, Adaptive, Inc.

That was only the beginning of Tracker's packaging problems. Claiming that the cover smacked of racism, distributors refused to stock the program, and at least one trade magazine declined to run Adaptive's ad.

Although Tracker did land catalog distribution through Power-Up

and Spite Software, Buckley, an American, recalls the situation as "absolute hell." To spur sales of the 10,000 copies that had already been printed, he says, "we had to sell it as an oddity."

Last February the company issued the program in new packaging—with blue type on a plain white background—but Adaptive is still recovering from the initial marketing fiasco. "We just bumbled onto the market, and it has cost a lot of money to make those mistakes," Buckley laments.

Dac Software committed a different kind of cultural gaffe when it introduced DacEasy Accounting in 1985. Originally written in Mexico, the package was priced at just \$50. "People said, 'Who's going to trust their accounting system to a \$50 program?'" recounts Dac president Kevin Howe. "People made fun of us. We were different, and any time you're different, people think you're wrong."

"In hindsight, I can think of a few people who were concerned about whether Mexicans could program as well as gringos," Howe says. "Normally people look at Mexico not as a trading partner but as a labor supply." Nevertheless, the program's value eventually overcame prejudice and its "sterile" user interface to become a hit. It's now sold in 18 countries, in versions for nine languages.

Dac's success lends support to those who see the software market as a place where products stand on their own merits. Guy Kawasaki, president of ACIUS, which publishes 4th Dimension, a relational database for the Macintosh, considers the program's French origins irrelevant. "Great software is great software," he says. "It doesn't matter where it comes from." —Deborah Asbrand

*Deborah Asbrand, an associate editor of PC/Computing, likes Italian food and Australian software.*



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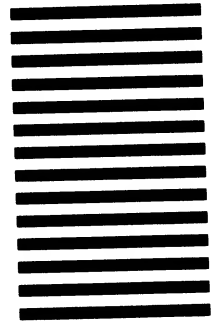
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chines. The country's largest association of data processing professionals, traditionally a mainframe- and minicomputer-oriented group, has asked the JPSA to offer its members periodic training sessions in the use of personal computers.

To serve the growing demand, 74 of the top 96 software developers in Japan now report that they're working on applications for 16-bit personal computers. That's almost double the number that say they're developing applications for 8-bit micros, minicomputers, or workstations.

**Yasuhiko Ohmori, head of the Soft-Bank Corporation, Japan's largest software distributor, believes Japanese vendors will have to struggle to survive U.S. competition.**

### ... And We're Going

The U.S. software lead is generally estimated at three to five years. But MITI predicts that it will narrow Ja-

Just as important, a number of outstanding word processing programs, able to deal effortlessly with Japan's written language, have been developed for personal computers, and the software houses that produced them are entering into licensing agreements with U.S. companies to adapt new American applications for sale in Japan.

With all the activity in the market, Japanese end users are paying more attention to PCs and buying more application programs for 16-bit, AT-type ma-

pan's software import-export gap from today's 5-to-1 ratio to less than 2-to-1 by the year 2000. Volume, meanwhile, is expected to explode. In 1984, for example, Japan imported 232,000 units of software, while exporting just 48,000, mostly games. By the turn of the century, MITI says, Japan will import more than 30 million pieces of software a year, while exporting more than 17 million units.

The first step is to increase Japanese familiarity with leading PC software packages. Within the past

PHOTOGRAPH BY RHODA BAER

## Software Japan Likes to Write

Japan may not be a giant in the world of PC software, but the country does care passionately about creating it.

The difference is that for Japan, Inc., the long-term dreams and fears of big electronics companies count for a lot more than the needs of hot new software start-ups.

Unlike the U.S. concentration on writing business applications for today's personal computers, Japan's important software projects aim further in the future, seeking to ensure the long-term success of existing companies.

Japan's Fifth Generation artificial intelligence project illustrates the kind of software development that the country truly takes seriously. The Fifth Generation project, a joint government-industry program aimed at business goals for the 1990s

and beyond, seeks to advance one crucial kind of software in a specific direction that will produce fruits for decades.

The well-organized development team hopes to create a new parallel computer architecture—and associated software—that will let computers behave like the human mind, conversing in ordinary Japanese or English and learning and reasoning in a humanlike way.

Late this year, the Fifth Generation project is scheduled to demonstrate prototypes of the major components of the artificial intelligence system it intends to build. These prototypes will include a sophisticated logic-based problem-solving system, parallel processing capability, a system designed to store large amounts of knowledge for easy retrieval, and software that can pro-

cess ordinary Japanese or English.

Even though the prototypes are apparently complete, work on refining them is scheduled to continue through March 1992, ten years after the program's launch. And even if the project is highly successful, widespread commercialization probably won't begin until later in the 1990s.

The Fifth Generation project fits into a sustained and successful tradition of long-range research in Japan. Since the 1960s, Japan has funded a series of projects aimed at producing business technology too advanced to attract intensive private research—often the main benefits are not expected for 10 to 20 years after their launch. The Pattern Information Processing Systems (PIPS) project, for instance, which got underway in 1971, contributed



year, the JPSA launched a number of initiatives to encourage small-to-midsize U.S. software houses to forge alliances with Japanese companies and bring their products to the Japanese market.

Beginning in April, MITI will fund the translation of U.S. programs into Japanese for companies that have struck trade alliances with American firms. MITI will also help them to "localize" the software by adding features attractive to the Japanese market. "Without localization of software, you will not get sales," says Kanoya. "It has to be done [to everything], even operating systems, tools, and programming languages."

The JPSA sponsored a tour of American software publishers to Tokyo in June, and it promoted Japanese market opportunities at the annual meeting of the U.S.-based Software Publishers Association in September.

More significantly, at the behest of MITI, the JPSA has invited U.S. software houses to display their products at a Tokyo trade show next year, where JPSA and MITI representatives will review American products, determine which ones best suit Japanese business needs, and assist their manufacturers in adapting the products for sale in Japan.

The Japanese initiatives will open up opportunities for U.S. companies that want to sell software in Japan. But Heidi C. Hijikata, an international economist with the U.S. Department of Commerce's Of-

fice of Computers and Business Equipment, warns that differing expectations can make selling software in Japan risky.

"When U.S. companies go to Japan, they should know that price is not as important there as here," Hijikata says. "The Japanese are finicky about every detail of the program. They expect it to be perfect."

The common American practice of putting PC software on the market to generate sales before all the bugs have been worked out is not tolerated in Japan. Very small bugs can forever bias Japanese consumers against products, even if later versions include dramatic improvements.

### Unifying the Market

Japanese and U.S. companies alike are frustrated by Japan's fragmented hardware market. But developments inside and outside Japan hold out hope of greater standardization.

IBM has announced plans to release a Japanese PS/2 computer, the Model PS/55, designed to be compatible with both the earlier Japanese 5500 model and the PS/2 machines of the West. Applications designed to run on the PS/2 in the United States should be able to run on the PS/55 with minimal adaptation, and vice versa.

Within Japan, a consortium of 150 hardware companies has challenged NEC's market dominance by agreeing on a standard specification for 80286 and

to the development of Japanese products such as thermal printer heads and charged-coupled device (CCD) chips now used in scanners and video cameras.

At the beginning of the 1980s, Japanese science officials realized that computing in the 1990s would depend on parallel processing, that is, the ability of computers to execute many instructions at the same time. They also concluded that computers could effectively use multiple processors for artificial intelligence tasks through the use of software based on an artificial intelligence computer "language" called Prolog, an acronym for "programming in logic."

This logic-based language doesn't have to follow instructions step by step; instead, each statement a programmer makes is treated as a logical proposition. It builds those propositions into a "knowledge base" and then searches it for answers to users'

questions. Prolog uses multiple processors relatively easily, since many processors can work together to search such a collection of logical propositions.

Prolog parallel processing may or may not come to dominate artificial intelligence technology. But Japan believes that putting a few key engineers from top companies to work on artificial intelligence and parallelism now will surely provide an edge for the 1990s.

The investment is relatively small compared with the possible payoff. The Fifth Generation project's annual budget—about \$42 million in government appropriations last year, plus undisclosed contributions from private companies—could fit comfortably within IBM's \$4 billion-a-year research budget.

If even a few of the Fifth Generation project's key technologies propel dramatic growth in artificial intelligence during the 1990s and

beyond, the Japanese participants would have a huge advantage. Computer software that could reason as the human mind does and also converse in natural language would have an almost inconceivable variety of applications.

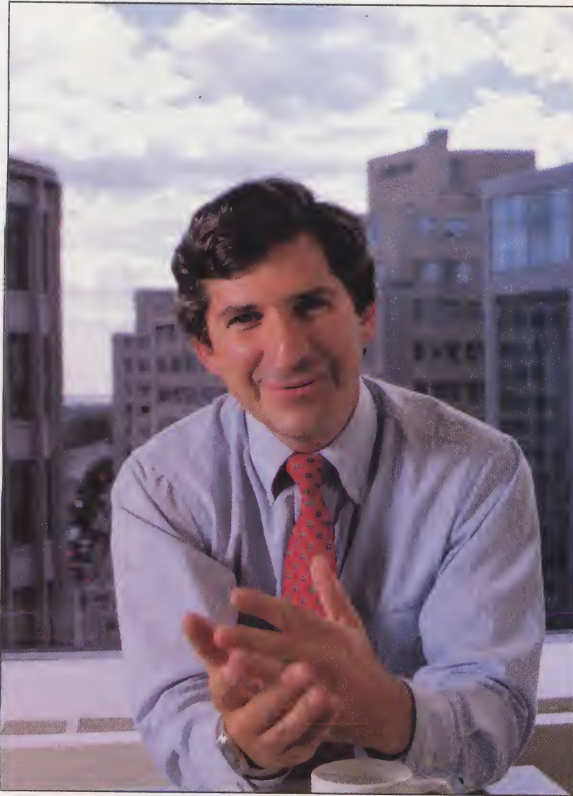
Personal computer users won't be the first to get this technology, of course, but simple economics dictates that they won't have to wait forever.

Hardware companies, at least in Japan, know that to continue to make money, they must bring leading-edge technology to ordinary users. PCs will share in the power of parallel-processing artificial intelligence software—if not in five years, then surely in 10 or 15.

—Robert Chapman Wood

*Robert Chapman Wood is a writer and business consultant who specializes in technology and the economies of the Far East.*





80386 computers. Known as AX, or Architecture Extended, the spec would make computers bilingual—able to handle single- and double-byte character sets—and also IBM BIOS compatible (see Asiatech department, *PC/Computing*, October).

"It would be wonderful" if AX caught on, says Hijikata, "but a lot of people don't see that happening. If you're a typical Japanese company without a number of English-speaking employees, why buy it?"

If AX succeeds, it would also ease software trade across the Pacific, in both directions.

"When any global standardization is developed," predicts Yasuhiko Ohmori, the chairman and CEO of the SoftBank Corporation of Tokyo, Japan's largest software distributor, "the first wave will be more American software coming into Japan. I think that is because American business [software] is more advanced. Japanese software companies will have to struggle to survive that wave."

He says a kind of natural selection will leave the best Japanese firms positioned to compete with U.S. firms on a more equal footing. "I think the ultimate winner will be the one that can deliver the better software."

Ken Wasch, executive director of the Software Publishers Association, which is working with the JPSA to bring American and Japanese developers together, says, "From our perspective, software development and marketing is a global enterprise."

Wasch believes, however, that Japanese program-

mers are overly interested in designing operating systems, to the detriment of building "great applications."

The JPSA's Kanoya agrees that Japanese developers seem to be preoccupied with issues surrounding the operating system. "A good indication of that is, when we have an operating system session, we always sell out," he says.

The Japanese want to make sure that they develop applications for the operating systems of the future, not of the past. They are confident that operating systems will continue to change.

### Changing the Rules

For Japan to succeed in the PC software market, things will have to change. As long as American companies such as IBM, AT&T,

**"Software publishing is a global enterprise," says Ken Wasch, executive director of the U.S.-based Software Publishers Association. He's working to bring U.S. and Japanese software publishers together.**

Microsoft, and even Apple continue to set world standards in hardware and software, the United States is likely to remain on top of the PC applications market.

But what if a whole new technology were to emerge to supplant the personal computing industry as we now know it? And what if that

technology were as native to Japan as PCs are to the United States?

The Japanese, exhibiting their penchant for long-range planning, are already hard at work looking for new technologies that might answer those questions. The Fifth Generation project, a long-term government-industry program that seeks to design a truly intelligent computer system, is only one of the efforts under way (see sidebar, "Software Japan Likes to Write"). The Japanese government is also pouring resources into the Sigma Project, designed to produce a network of workstations and modular software that can be assembled in whatever configuration best meets the needs of a particular client. And TRON, which stands for The Real-time Operating system Nucleus, is a ROM-resident operating system under development at the University of Tokyo that will govern the integrated operation of mainframes, micros, and even robots.

None of these initiatives immediately threatens to supplant the IBM-Microsoft-AT&T-Apple axis of U.S. dominance in PC computing. But they do indicate the Japanese government's interest in finding an integrated solution to the fragmentation in the Japanese personal computer industry.

"The Japanese," says Duncan Sutherland, "tend to look at it in a very systematic way, as integrated systems. If they do come up with a better magic being, there are an awful lot of industries in this country that will be in trouble." ■



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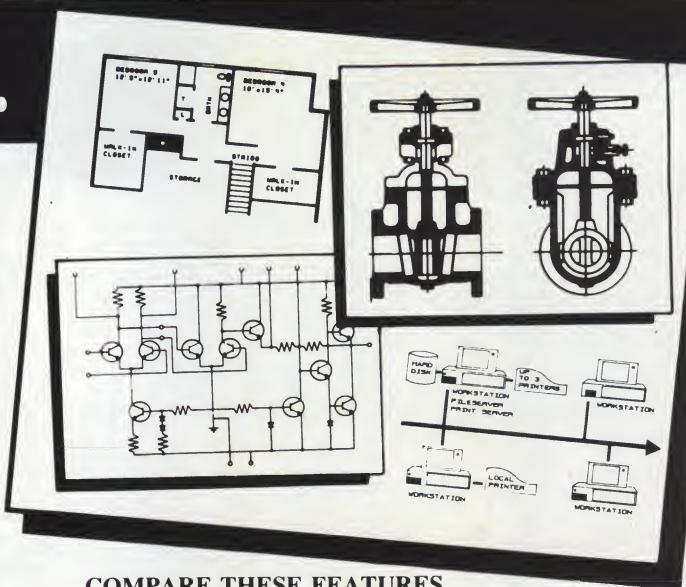
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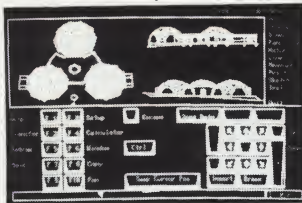
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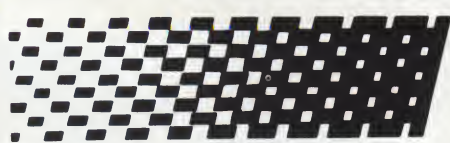
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# Fast Talkers: 2,400-bps Modems


I'm embarrassed. I've been doing my best to keep up with computer standards. I did a good job upgrading my CPU—moving from a CP/M machine to a PC, then to an AT, and this year to a 386 clone. My display has evolved from a monochrome to a Hercules to an EGA, and finally to a VGA running Windows/386. And I've even hopped from a single floppy disk drive to a high-density floppy, to a 10MB hard disk, and now to a 40MB high-speed disk. So how do I explain why the modem on my desk moves only 1,200 bits per second? Well, I guess I just wasn't paying attention while technology and the market were putting faster modems within my reach. What I was paying was large phone bills and online service charges—larger, at least, than I would have paid if I had invested sooner in a faster modem.

And it's a strange thing I didn't notice my modem's age. My computer spends a lot of time on the phone, sending and receiving research information,

**Lower prices and higher speeds are making 2,400 bps the new datacom standard.**  
By PHILLIP ROBINSON

checking for mail, sending invoices. The only way to do these things is to have a modem—an electronic device that can convert digital computer information into analog telephone-line information—attached to the computer. Naturally, when the information is arriving from some other computer's modem, your modem also must be able to convert the signal from analog back to digital.

The less time my computer spends with a live phone line, the less I pay to my local and long-distance phone companies and to the online computer services I use, such as CompuServe, The Source, and



While faster is better, compatible is still important, and the Hayes Smartmodem 2400 follows the Hayes modem command set, naturally. Microcom has set a standard for its modems, too, including the AX/2400c: the MNP Class 5 error-correcting protocol.





the BYTE Information Exchange (BIX).

You're certainly familiar with phone-line charges. But you may not know that although the online services often charge a premium for using a faster modem, the increased speed more than offsets the added cost. For instance, The Source's prime-time rate is \$.43 per minute for 1,200 bps and \$.46 for 2,400 bps.

CompuServe, in fact, charges \$12.50 an hour for either 1,200 or 2,400 bps, though the Tymnet local access scheme can add a \$12-per-hour surcharge for prime-time 2,400-bps work, \$2 for off-peak. BIX charges \$12 and \$9 for peak and off-peak 1,200 bps,

### **Hayes Smartmodem 2400**

**List Price:** \$599

Hayes Microcomputer  
Products, Inc.  
705 Westech Dr.  
Norcross, Ga. 30092  
404-441-1617

### **Microcom AX/2400c**

**List Price:** \$699

Microcom, Inc.  
1400 Providence Hwy.  
Norwood, Mass. 02062  
800-822-8224



and adds only \$2.50 peak and \$1.50 off-peak for 2,400 bps; Tymnet adds \$8 and \$2, respectively. Still, in off-hours, that's only about 20 percent more than the base rate you'll pay the service—so you get twice the speed for a 20 percent increase in cost.

### Leaps in bps

The bottleneck in the information transfer scheme is the modem-to-modem work. Not only are modems restricted by the speed at which they can convert information, but the phone line between modems can limit how quickly and accurately the analog information can be moved from one modem to another.

The computers themselves are quite willing and able to send and receive information at much higher speeds. A typical serial port can squirt out data at 9,600 bps or faster without blinking. I can't change the phone lines, but I can get a faster modem, as long as the price doesn't break my budget. When the prices are right, the money I save on phone bills will quickly pay for the investment.

There's something else I could save with a faster modem: time. The faster the information goes

**A faster modem saves time, money, and something else: after my first few minutes of 1,200 bps, I swore I'd rather not go online at all than suffer through 300 again.**

through the modem, the less time I have to spend watching the screen, waiting for a file or note to scroll. I remember the days of working at 300 bps. After my first few minutes of 1,200 bps, I swore I'd rather not go online at all than suffer through 300 again. With a 300-bps modem, you can move about five words a second. (It takes about 10 bits to move a single character, and the average word contains six characters.) Naturally, 1,200 moves four times that: 20 words a second.

In other words, instead of needing a full minute to display a page full of text from some distant computer, a 1,200-bps modem can do the job in 15 seconds—a livable duration. In fact, at 1,200 bps, I found myself sighing over how quickly the characters tumbled out of the modem—I was seeing entire lines zip onto the screen.

Since 1,200 bps is such an improvement over 300,

---

*Phillip Robinson, an engineer and the editor of Desktop Engineering News, remembers when computer communications meant carrying a paper tape from one machine to the next, and being amazed at the speed of 300-bps modems.*

isn't a 2,400-bps modem an unnecessary luxury? Larry Cynar, an analyst with Dataquest, a San Jose, California, market research firm, says that "in 1987 the 1,200 outsold the 2,400, but the 2,400 will probably end up outselling the 1,200 in 1988."

But are 2,400s selling just because they're newer? Is there a "rising entitlements" factor, a keeping-up mentality that ignores the practical issues at stake? Not according to most of the people I asked. Larry Cynar says, "The 2,400-bps systems offer some good service for the price, and the prices have become very attractive. They keep coming down in price because the chips that determine most of their cost are continually dropping in price. Companies such as Intel and Rockwell now have 2,400-bps chip sets that make a 2,400-bps modem fairly simple to design and produce."

Cynar points out that, although you "may not get a full doubling in speed" if you switch to 2,400 from 1,200 bps because of phone line noise or time spent typing or waiting for the remote computer to respond, "it doesn't take long to pay for your modem if you're sending files for 15 or 20 minutes across the country"—especially since 2,400-bps modems can now be had for "\$200 or even less."

George Bond, executive editor of BIX, in Peterborough, New Hampshire, estimates that "80 percent of the people on BIX own 2,400-bps modems—it's gotten so cheap." Most of the others work at 1,200 bps, Bond says, though "some people are still using 300 bps. I do when I'm traveling with my Model 100 laptop and its built-in 300-bps modem."

Craig Gillett, the manager for sales systems, planning, and information at Coca-Cola Foods in Houston, says his company made the transition to 2,400 bps three and a half years ago. "I wouldn't even consider a 1,200." The only 1,200-bps modems Coca-Cola still has are the kind "built into laptop computers." His own Zenith laptop has just such a 1,200-bps modem, and Gillett has on occasion "packed a 2,400-bps modem" on the road just so he doesn't have to fall back to the older, slower speed.

The 2,400-bps modems at Coca-Cola Foods are used to support 17 remote sales offices. They handle communications with the firm's own remote bulletin board system and e-mail. "Until recently," says Gillett, "we had a handheld reporting system that field reps would use to capture data in stores and then send back each night through 2,400-bps modems."

Gillett's team also uses 2,400-bps modems for systems analysis and maintenance, dialing in from headquarters or from individuals' homes to PCs in the regional offices to "assist with application problems or even debugging software. Several of us who can't get enough done during business hours are using 24s to dial in from home."

The files that Gillett typically sends and receives are database files and spreadsheets. He says the fast-



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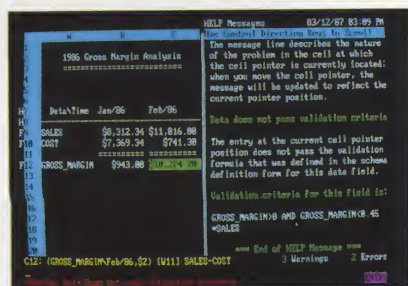
That's because Silk is the only spreadsheet that gives you an on-line, context sensitive, "live" screen tutor that makes learning almost child's play.

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Other spreadsheet programs are so difficult to learn that most users master only a fraction of their real potential. Instead, Silk's on-line screen tutor treats you with kid gloves. It will make you a power-user in a few sessions without ever studying the manual.



	Jan/86	Feb/86
SALES	\$0,312.34	\$11,616.00
COST	\$7,369.34	\$741.38
GROSS_MARGIN	\$943.00	

Help Message: 03/12/87 03:09 PM  
The message line describes the nature of the position in the cell at which the cell pointer is currently located: when you move the cell pointer, the message will be updated to reflect the current pointer position.

Data does not pass validation criteria  
The entry at the current cell pointer position does not pass the validation formula that was defined in the schema definition form for this data field.

Validation criteria for this field is:  
GROSS\_MARGIN >= 0 AND GROSS\_MARGIN <= 45

End of HELP Message  
3 Warnings 2 Errors

## Beyond 1-2-3

Silk is simple to use but powerful. It maintains the spreadsheet features that made 1-2-3 so popular but adds what 1-2-3 and the others lack.

Silk lets you build formulas as large as 1,000 characters and append each cell with text notes, so you'll always remember what your calculations are based on.

Silk has its own unique screen editor that lets you edit large cell contents—even formulas up to half a screen long. No other spreadsheet can.

## Auto Allocation

Silk even has a powerful new allocation feature that automatically distributes values proportionately over any number of cells you choose for any reason you wish to cut the pie.



With this feature you can re-allocate increased payroll or a revised financial budget at the touch of a key instead of hours of complex modeling.

You can even keep some cells at a fixed value. Many users find this feature alone is worth the purchase price.

And Silk even includes a lost work recovery feature, so you'll never lose your work again!



"Silk's improved graphics, fine use of function keys, interactive help, global search and replace, and easy-to-arrange worksheet are reason enough to buy... At some point, you have to think about moving onward and upward (from 1-2-3). Silk gives you reason enough."

— PC Magazine

Best of all, you can purchase Silk now directly from Daybreak for only \$99 during this special promotion. A real value savings compared to its regular \$298.00 retail price.

Of course, not everyone can use Silk immediately. Little Rebecca, shown here, will probably have to wait at least until the third grade.

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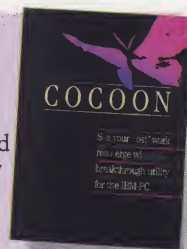
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Both Silk and Cocoon require an IBM PC or compatible with DOS 2.0 or later. Silk requires at least 512K with a hard disk recommended. Cocoon requires a hard disk.

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CIRCLE NO. 218 ON READER SERVICE CARD.



er modems also save time and money sending "presentation materials that we'll transmit to a sales office, where the materials can be customized and printed locally."

Donald Campbell, a senior systems analyst with Martin-Brower, a fast-food distributor in Des Plaines, Illinois, says that "the price difference between 1,200 and 2,400 is not that much, and the difference in speed basically pays for itself." He maintains that "the speed you need depends on what you're doing—how frequently you're moving data, what amount of data you move, how good the phone lines are, and so on."

And Martin-Brower apparently needs even more speed than 2,400 can deliver. It has shifted its system from 2,400 to 9,600 bps. Modems that can move 9,600 bps represent the leading edge of modem technology (see sidebar). The high transmission rates are matched by high prices—\$900 to \$2,000. And while some standards exist for data transmissions at that speed, four times as fast as 2,400 bps, the modem manufacturers have resorted to an incompatible grab bag of strategies to keep costs down and speeds up.

"We have some 2,400s to communicate from PC to PC," says Campbell, "but we move a whole lot of data daily among 31 distribution centers and headquarters, so we have leased telephone lines and 9,600-bps modems." Campbell admits that 9,600 is addictive, saying that "when we go back to 1,200 or 2,400, everybody says come on, let's go faster."

Coca-Cola's Gillett says that he has "brought in some 9,600-bps modems, and at this point [we] are trying them on a test basis. We don't want to take that step forward until we know where the technology of 9,600 will standardize, especially since we're expanding our network on a wide area next year." Because of the "tremendous difference in file transfer and screen display from 2,400 to 9,600," however, "there isn't any reason we'll buy anything less than 9,600 as we move forward."

Barry Gerber, the administrative director of the Social Sciences Computing Group at UCLA, is experimenting with a special data compression box called the Quik-Pak 96, from E-Comms, Inc., of Gig Harbor, Washington, which sits between the computer and the modem and compresses files to 25 percent of their original size.

A pair of these boxes—one each for the sender and receiver—produces the equivalent of 9,600-bps file transfer speed using 2,400-bps technology. At \$349 apiece, this solution would be cheaper than spending \$900 or more for a 9,600-bps modem that "doesn't even offer much of a standard yet," says Gerber. Unfortunately, he adds, "there are problems with the Quik-Pak running some of our software, such as Carbon Copy, one of our major packages."

Dataquest's Cynar says that compression will play a larger role in modem communication, pointing out

that "the price of compressing 2,400-bps work will be a lot less than moving to a straight 9,600-bps modem; for some applications it makes a lot of sense." But not all files can be compressed the same amount. Spreadsheet files, for instance, can sometimes be squeezed to 10 percent of their original size, while gray-scale scanner files repel any attempt at compression.

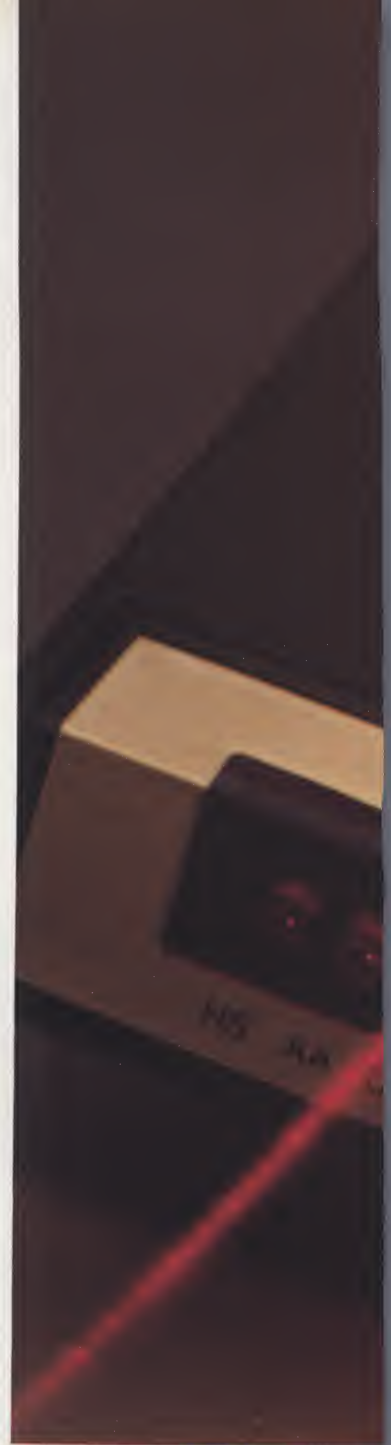
What's after 9,600? Cynar indicates that 9,600 will likely be around for a while. "Ninety-six hundred is a good

**OmniTel's Encore 2400HB is an internal modem that provides the basics for a low price. US Robotics' Courier 2400e, on the other hand, includes some advanced features.**

speed to match the speed of lots of other devices: printers, comm ports on computers, and so on," he says. But modem manufacturers are talking about the "universal modem," or UM, which would have "compression, security, password protection, and automatic compatibility with any other modem in the United States or internationally, at any speed from 9,600 on down, all built into chips and tucked into the modem's hardware." That's at least five years off, according to

Cynar. It sounds as if I've got some time to get to 2,400 bps and to relax and enjoy it before I have to upgrade to a faster speed again.

**Hayes Smartmodem 2400 (External)** If you've ever seen a Hayes external 300-bps Smartmodem, or a 1,200, then you know what the 2,400 looks like. It comes in the same brushed aluminum case with black plastic end caps found all over the microcomputer world—just another reminder that, after all, Hayes is the IBM of modems, setting standards and dominating the market.







Naturally, the Smartmodem 2400 follows the Hayes AT command set. It also follows the V.22 bis, V.22, Bell 212A, and Bell 103A standards for work at 2,400, 1,200, and 300 bps. Setting it up is simple. Use a serial cable to attach it to a serial port on your computer, plug in the power supply—an adapter much like the kind you'd use with a tape recorder or desktop calculator—and connect a phone line.

A Getting Started booklet explains this in a few illustrated pages. If you need more help you may turn to the User's Guide, a thicker volume that includes troubleshooting tips, a glossary, an index, and

#### **OmniTel Encore 2400HB**

**List Price:** \$399

OmniTel, Inc.  
3400 W. Warren Ave.  
Fremont, Calif. 94538  
415-490-2202

#### **US Robotics Courier 2400e**

**List Price:** \$699

US Robotics, Inc.  
8100 N. McCormick  
Blvd.  
Skokie, Ill. 60076  
312-982-5010



so on. I didn't need either before starting up a telecommunications program and dialing up a few bulletin boards.

The Smartmodem 2400 boasts eight LED indicator lights on its front side that tell you when data are moving on the phone line, when your computer is ready to send information, and when your phone is off the hook. These are handy if you need to change the modem's configuration.

When you do decide to reconfigure, you'll discover that the Smartmodem 2400 hides all its switches—even the volume control for the speaker—in hardware. Instead of flipping dip switches, you'll have to look in the manual for the commands that dictate and store configuration details in nonvolatile memory chips within the modem. These chips accommodate two complete configurations, holding onto them even when the modem's power is shut off. (The Smartmodem does have an on/off power switch on its back side.)

The chips may also store four phone numbers for autodialing. The modem's features include autodial and autoanswer abilities, self-testing circuitry, and a speaker with a software volume control. Hayes offers its own Smartcom II telecommunications program for \$149 extra.

The Smartmodem 2400 has a special AutoSync ability built in for super-high-speed synchronous communications with other AutoSync modems or computer peripherals. This is a Hayes protocol for tightly organized transmissions that can be much faster than the standard asynchronous work most modems handle. It hasn't yet gained favor in many other microcomputer modems.

The Smartmodem 2400 does not support the MNP (Microcom Networking Protocol) error-hand-

**I had a much harder time setting up the Microcom modem than any of the others, but for some people its advanced features may make the learning worthwhile.**

dling protocol, which allows the US Robotics and Microcom modems reviewed here to work at 4,800 bps. Hayes does sell a more expensive (\$899) V-Series 2,400-bps modem that has its own "adaptive data compression" scheme to transmit at 4,800 bps, but it doesn't work with MNP modems: you'll need two V-Series modems to reach that doubled speed.

I admit to liking the simple installation and reliable performance of the Smartmodem 2400. But while the software-only configuration and volume control are flexible, I'd prefer to have some direct manual control of such details. And I'm not thrilled by the price

or the strict adherence to Hayes standards, such as ignoring the public-domain MNP protocol in favor of the company's proprietary system.

**Microcom AX/2400c** The Microcom AX/2400c is the largest of the external modems reviewed here, thicker and longer than the Hayes or US Robotics models, but still only about the size of a hardcover novel. It does not have a mechanical speaker volume control or an on/off switch—I wish it had both.

The AX/2400c can store configuration information and nine phone numbers in internal memory chips, but it also has a pair of dip switch banks—one in front and one in back—for manually setting some configuration details. Three other buttons let you reset after changing configuration, transfer control to and from a handset connected directly to the modem (a handy feature), and alternate between asynchronous and synchronous modes.

The AX/2400c's basic features generally match those of the other external modems, with V.22 bis, V.22, Bell 212A, and Bell 103 support, self-testing circuits, autoanswering, and autodialing. Besides the Hayes AT command set, the 2400c also supports Microcom's own SX command set.

I had a much harder time setting up the Microcom modem than the other three modems in this review. To get it to work as a simple 2,400-bps modem without any sophisticated features, I had to set switches on the back and front and then issue several commands, such as "AT\J0&W," from my program. These set internal configuration details and instructed the modem to use the Hayes AT commands instead of the default Microcom SX commands.

The settings I needed weren't explained in the manual, which had installation information for several popular telecom programs but not for the one I was using, ProComm. The tech support people at Microcom were able to help me on the first call, and the AX/2400c then performed surely and smoothly. However, each time I started it, I had to either issue some of those same commands or write a script that would automatically send them to the modem.

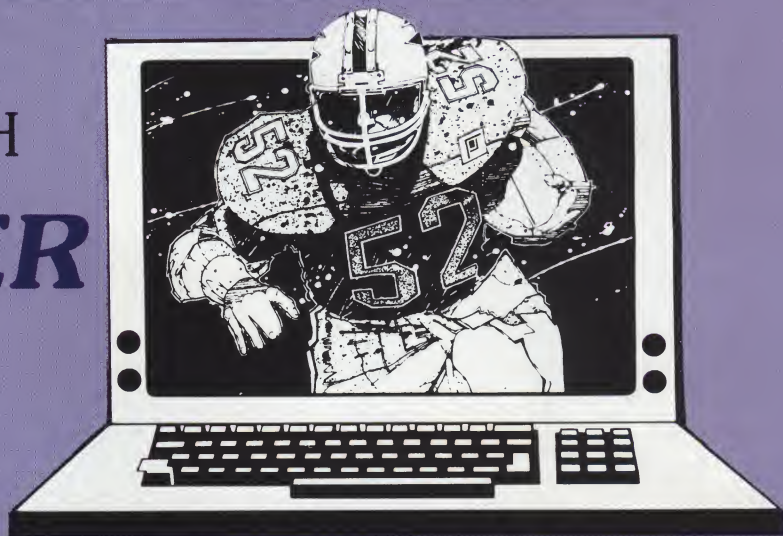
Using the advanced features of the AX/2400c wasn't a picnic either, but for some people those features may be appealing enough to make the learning worthwhile. The AX/2400c is an MNP Class 5 modem, like the US Robotics Courier 2400. Microcom invented MNP and put it into the public domain to make it a communications standard.

"Class 5" means the modem includes hardware for data compression and uncompression. When one Class 5 modem talks to another, the transmissions are protected from errors and can run as fast as 4,800 bps. You could get some of this effect by using a software compression utility. There is a Class 6 level as well, which can reach the equivalent of 9,600 bps under the right conditions. *(continued on page 136)*



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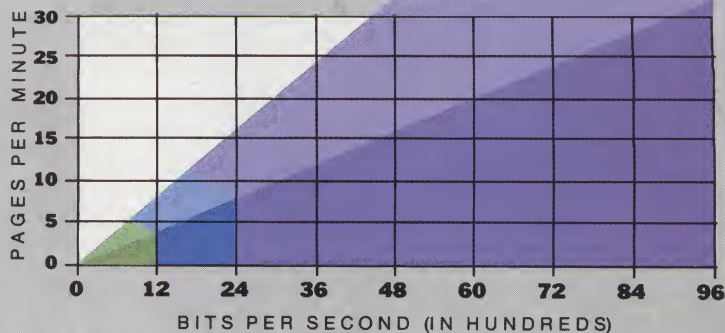
## Modem Primer

You'll often see a modem's speed referred to as *baud*, which refers to the number of segments per second of a transmission signal that can hold information. Once upon a time, the baud rate of many modems was the same as the bits-per-second transmission rate for information. However, faster modems such as 2,400s move multiple bits during each baud interval. A 2,400-bps modem may technically operate at 600 baud, moving 4 bits per baud interval.

Common usage has given *baud* the same meaning as *bps*, but some techno-weenies will grunt, sigh, and lecture you if you refer to a 2,400-baud modem when they think you mean 2,400 bps. Just smile and tell them that you're simply using the vernacular to refer to a 2,400-bps dial-up modem using QAM (quadrature-amplitude-modulation) technology for full-duplex communication following CCITT V.22 bis rules.

That V.22 bis part is important—the rest is true, but not really important for day-to-day work. The Consultative Committee for International Telephony and Telegraphy (CCITT) is an international standards body in Geneva, Switzerland, that has published technical standards rules for communications devices. (Previous standards in the United States were set by the Bell folks and were called Bell 103 for 300 baud and Bell 212A for 1,200 baud.) The V.22 standard is for 1,200-bps work, the V.22 bis standard for 2,400-bps work.

The other standard to pay attention to is the Hayes AT command set. This is the set of commands that a computer can issue to a modem to make it dial, redial, hang up, and so on. Hayes is to modems as IBM is to PCs—the standard-bearer and the standard-setter. The closer your modem's compati-



**300 bps (at 10 bits per character) = 30 characters per second**  
**Average word = 5 characters**  
 $30 \div 5 = 6$  words per second  $\rightarrow$  350 words per page at  
**300 bps = 1 page per minute**

bility with the Hayes AT command set, the better your chances that all your communications programs will run with the modem.

Another decision to make is whether to buy an internal or an external modem. An internal modem slips into a slot inside your PC. It will work off the PC's power supply and won't clutter up your desk. An external modem will probably cost a bit more because it has its own case and its own power supply. External modems typically connect to the PC through a serial port and cable. They take up more desk space, but they also offer portability: you can move them from one computer to another. In fact, an external modem can be used with a variety of different computer systems. One external modem might work with IBM PC, Macintosh, and PS/2 systems.

You'll want a modem that has multiple phone jacks (this isn't critical, but it's nice to put the modem in line with other telecom devices), can handle both full- and half-duplex work (sending both directions at once or only one direction at a time), and has auto-answer, autodial, and autoredial built in. With that automatic control, you'll be able to leave your modem to do its work in off-hours, and you won't have to play with its

switches or the phone receiver while using it directly.

It's a nice touch to add some hardware error correction abilities, such as the Microcom Networking Protocol (MNP), but you probably won't depend on it, so you shouldn't pay too much extra for it. Many people also like a modem that has speaker volume control. (Don't go for a modem with no speaker, even if you believe computer silence is golden. The speaker can be a lifesaver, helping you figure out where problems are occurring when you're trying to communicate with another system.)

Finally, remember that the rated speed of a modem is not always what you'll really see in action. (Just think of EPA mileage for cars and you've got the idea.) Because of problems with line noise and other irritants, 9,600-bps modems, for instance, may typically work at 8,500 bps or so. This is another reason to buy a faster modem, however, because 2,400-bps modems do a better and more consistent job at 1,200 bps than do 1,200-bps modems. Compressed files, squeezed through software or special hardware, can be sent at higher effective speeds, so you should keep your eyes open for compression utilities and compression features in modems. —PR



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Microcom also sells an AX/2400 modem (without the "c") that does not have MNP Class 5 abilities but does offer Class 4 features and costs a hundred dollars less: \$599. I'll be glad when 4,800 bps doesn't require special protocols and commands but is just there automatically, using a standard protocol.

The AX/2400c sports a security feature not offered by the US Robotics or Hayes modems and not possible with the OmniTel modem: you can program different levels of passwords for calls to your modem.

The manual covers such sophisticated subjects as synchronous communications and leased-line operation. If you're ready and willing to play with switches, commands, and setup scripts, the AX/2400c can offer you more power than the other modems.

**OmniTel Encore 2400HB** I expected the Encore 2400HB to be a tougher installation job than the other three modems reviewed here, simply because it's an internal modem—a modem on an add-in card that

## Just to Feel the Wind in Your Hair

It takes about an hour to transmit the contents of a 360KB disk at 1,200 bits per second, a half hour at 2,400 bps. For many users, that's still too much dead time. A new crop of 9,600-bps modems can do the job in eight minutes, or even less using some data compression techniques.

But speed has its price. A 9,600-bps modem that conforms to the CCITT V.32 standard costs about \$2,000. The reason for the wide cost gap between 2,400-bps modems and 9,600s is the difficulty of implementing the V.32 requirement for full-duplex operation—a modem that can talk and listen at the same time.

The problem occurs when the listening line picks up echoes from the outbound data. John Humphrey, a general partner with TeleQuality Associates, a Golden, Colorado, firm that tests communications equipment, says the solution is in devising echo cancellation techniques.

"The modem has to remember the spectral pattern it transmitted a microsecond ago, a millisecond ago, ten milliseconds ago, and so on," he says. "Then you scale it, invert it, and thumb it back into the data stream to leave nothing there but the incoming data stream. In theory, you can do it. In practice it's a real bugger of a job."

To reduce the price, manufacturers have found ways to skirt the V.32 standard with their own pro-

prietary designs. The Hayes V-Series Smartmodem 9600 and the internal 9600B simulate full-duplex operation by opening one channel in "ping-pong" fashion. The Courier HST divides the phone line into high-speed and low-speed channels. And the Telebit TrailBlazer gets its edge by bundling data into smaller packets.

The good news is that these modems can really scream—up to 19,200 bps in optimal situations—and that now you can get into the game for as little as \$900. The bad news is that they'll talk to modems of different brands only at slower speeds.

For a lot of users, that's OK. James Jordan, president of the Cupertino, California-based Telebit Corporation, says his TrailBlazer modem should appeal to shoppers who are looking at high-end 2,400-bps modems. If they've been planning to spend \$600 or \$700 anyway, "they'll get four times the speed for about 20 percent more cost."

In other cases, users need high-speed capability only to connect two specific points, like a company's headquarters and one of its field offices. Philip Stults, a Gary, Indiana, lawyer who has 9,600-bps modems on his bulletin board system, says the modems are perfect for field office connections. "Let's say I have several law offices and I want to get a 50-page brief from Gary to my office in Valparaiso,

about 20 miles away, and the courthouse is going to close in ten minutes. I can send it all in less than two minutes."

How long will it take for universally compatible 9,600-bps modems to become as common as the 2,400-bps models? TeleQuality's Humphrey says to just be patient. "The way I see it, 1988 was the year V.32 became real," he says. "People stopped tire-kicking and started to plan network implementations around it. Now 1989 will be the year that it becomes affordable."

Then the engineers can rev up for still more speed. Microcom, of Norwood, Massachusetts, has already announced a modem that can reach 38,400 bps, and Humphrey predicts some company will hit 100,000 bps by 1990. Maybe by then someone will have figured out what V.32 is good for. For most PC users, it's overkill, says Mark Smith, communications director for modem maker US Robotics in Skokie, Illinois. "I'm hard-pressed to think of a PC application that requires high-speed, full-duplex, 9,600-bps communication."

—Ric Manning

*Ric Manning is the computer columnist for The Courier-Journal in Louisville, Kentucky, and author of The National Directory of Bulletin Board Systems, published by the Meckler Corporation, of Westport, Connecticut.*



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plugs into one of your PC's expansion slots.

An internal modem doesn't have a separate power supply—it takes its juice straight from the PC—and it doesn't have its own box or case, so internal modems are typically cheaper than external modems. However, they aren't as portable. If you move from a PC to a PS/2 with the new Micro Channel architecture bus, for instance, you won't be able to use your old-bus-style internal modem. Nor can you quickly use these modems with your laptop, Mac, or other computer. And they don't sport the LED indicator lights and volume control levers you'll find on external modems.

Setting up the Encore was actually quite easy, requiring only a minute or two more than setting up any of the external modems for this review. Slip off the top of the PC, slide the half-length modem card into one of the slots, slide the PC top back on, plug the phone line into the back of the modem, and start your telecom program.

There's only one other installation fact to consider: the serial, or COM, port assignment. When you connect an external modem to a serial port, you'll know which port you're attaching to. But an internal modem has a serial port of its own, and you may have to set it so it doesn't overlap with a port already in your system. The Encore comes set as COM2. Most computers have at least one serial port, called

COM1. I had two on my system and needed to flip a couple of switches on the back of the Encore board to change COM1 to COM3 or COM4. These switches are accessible even with the PC's top secured in place, and the manual does an excellent job of describing and illustrating how to set them.

Once installed, the Encore worked smoothly and reliably. It follows the V.22 bis, V.22, Bell 212A, and Bell 103A standards, supports the Hayes AT command set, and has autodial and autoanswer abilities, some built-in self-test circuits, and a speaker with software volume control. The Encore manual is clear and concise, with a long table of contents but no index. The modem comes with a copy of the ProComm telecommunications program.

The Encore 2400HB lives up to its 2,400-bps billing, but it is not adorned with any special features for work beyond basic tasks. The Encore does not have any of the advanced features touted by the other modems in this article, such as MNP for error control or a synchronous communications option for super-high-speed transmission.

**US Robotics Courier 2400e** The Courier is my favorite modem of the four reviewed here, though I'd be reluctant to buy it if I had to pay anything near the full list price. The 2400e is smaller than the Microcom unit and lighter than the Hayes Smartmo-

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dem. Installing it was simply a matter of plugging in the phone line, power adapter, and serial cable.

The Courier 2400e supports the V.22 bis, Bell 212A, and Bell 103 standards. (It does not fully support the V.22 standard for 1,200 bps. V.22 and Bell

**The Courier uses the MNP Class 5 protocol. When used with another MNP Class 5 modem, it can transmit at 4,800 bps.**

212A are similar, but they differ slightly in the way they answer a call. If you're in Europe and want a Courier 2400e to answer a call from a standard European 1,200-bps modem, you may have a bit more trouble because of this.) The Courier handles the Hayes AT command set, offers autodialing and auto-answering, and has an on/off switch and a built-in speaker.

Unlike the other three modems, the Courier has a manual slider control to set speaker volume—a nice touch. It can also turn the speaker on or off through software commands. Other configuration elements are also subject to this two-way control: there are memory chips to hold configuration data and one frequently dialed number, as well as a set of manual

switches in a recessed well on the bottom of the modem for directly setting some configuration details.

Printed onto the bottom of the modem is a summary of commands and configuration settings: a quick reference guide. The Courier also has its own printed quick reference guide, as well as a thorough, indexed reference manual and modem-generated help screens. What's more, the technical support number is toll free.

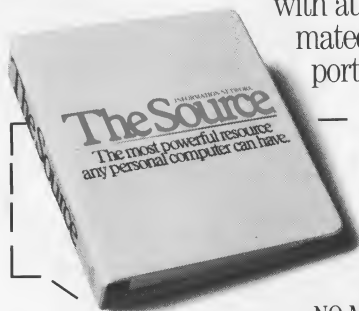
The Courier worked well at 2,400, 1,200, and 300 bps. I didn't encounter problems with line-noise sensitivity, which Courier modems have been criticized for. The Courier 2400e supports the MNP Class 5 protocol for higher speed and accuracy. This means it can catch errors and retransmit the flawed information when teamed with another MNP modem. When used with another MNP Class 5 modem, it can actually transmit at 4,800 bps. US Robotics also makes the Courier 2400 (without the "e") for plain-vanilla 2,400 work without the MNP abilities.

With its superb instructions, toll-free tech support, and flexible configuration controls, the Courier 2400e is a classy piece of equipment. If you can afford to pay extra for the "e" model, you may be able to buy into the future a bit—that day when the MNP protocol has become a common modem feature—and avoid line-noise problems while getting 4,800-bps performance. ■

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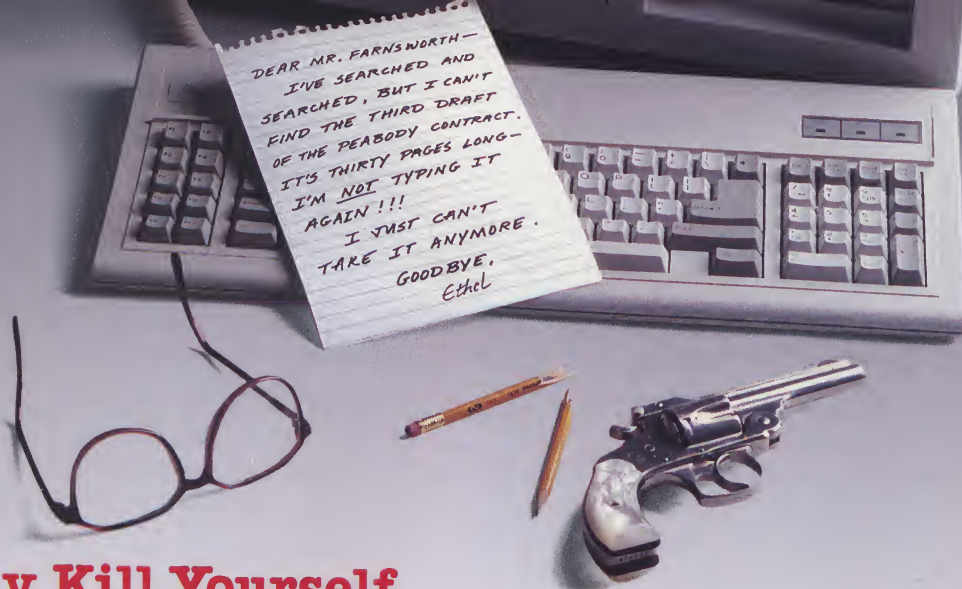
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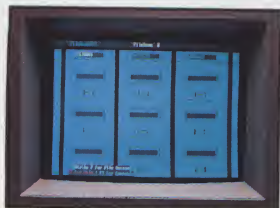
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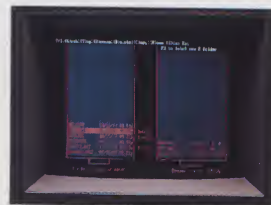
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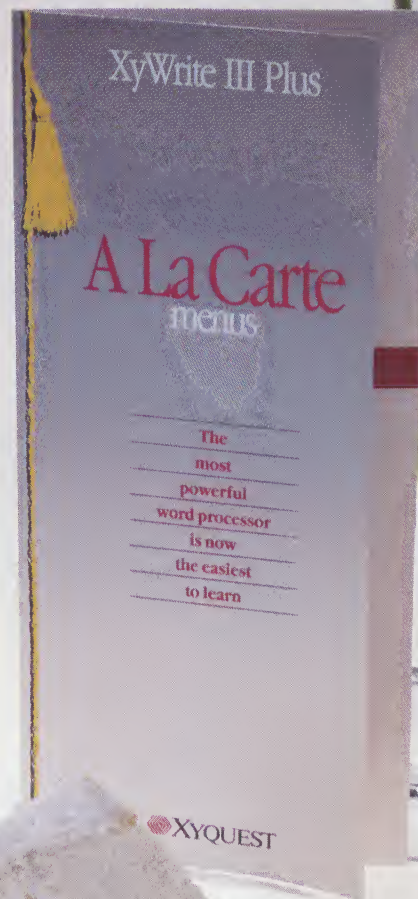
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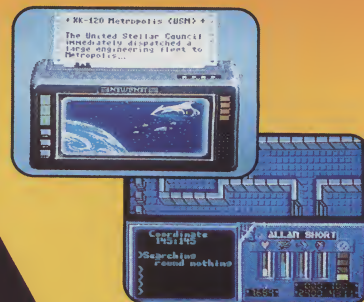
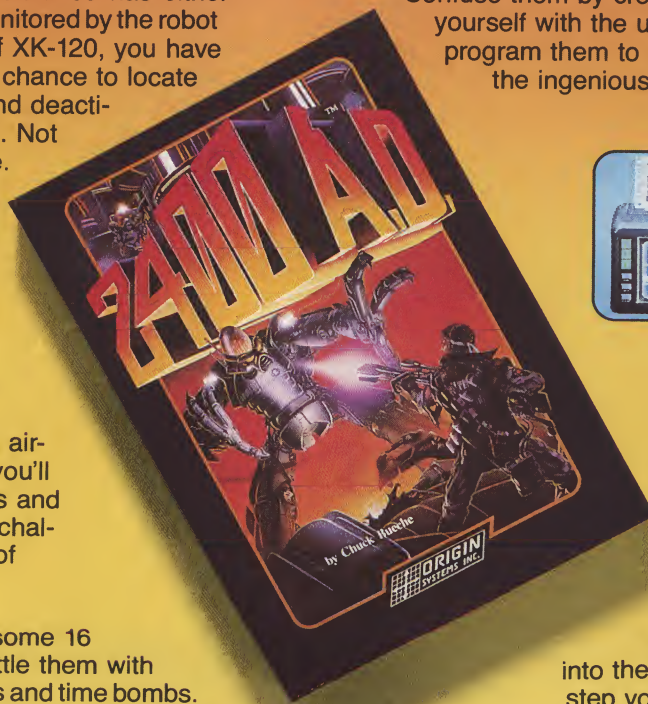
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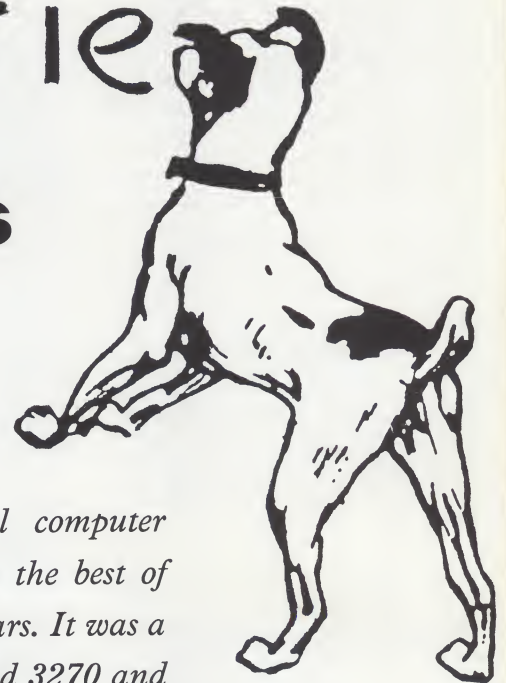
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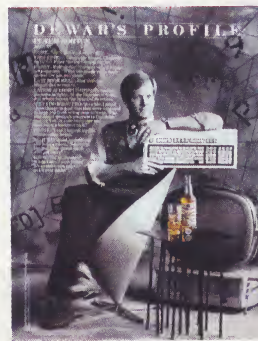
## ARFie Awards



# It's

*been another year in the personal computer business. Not the worst of years. Not the best of years. Certainly not the funniest of years. It was a year for SQL and TCP/IP and DMA, for 80386SX and 3270 and X.400. ■ It was a year like any other year, except that we were there, even though we might have enjoyed someplace else a whole lot more. ■ Nineteen eighty-eight offered plenty to keep the industry humble and PC users in stitches—so long as it wasn't their software upgrades that began to look like mirages, or the mail order laptops they purchased that turned out to be unusable, unportable, and ugly. As La Rochefoucauld pointed out, people often find in the pain of others that which does not displease them. Nineteen eighty-eight did not displease us. ■ So for our first December issue, and our final issue of the year, we at PC/Computing commemorate the following people, products, and events of 1988 by bestowing on them our Abort, Retry, Fail awards—ARFies, for short. ■ ARFies go to:*

### Computer Dweeb Makes Good



*Peter Norton, author of the Norton Utilities, for his appearance in a Dewar's Scotch ad. Norton's quotation for the whisky maker: "I can't believe my life is happening to me." Maybe he borrowed it from Bill Gates.*





### When Is a Bug Not a Bug?

When you're a Clipper software user who calls the Nantucket Corporation to complain about a problem with its long-awaited upgrade. Nantucket promptly adds your complaint to its official "anomalies list."



### Retrofit Lesson No. 30,286: Great Computers for the '90s

IBM vehemently denies any suggestion that the PS/2 Model 30 286 is just an AT in disguise—though David Thomas, president of Big Blue's national distribution division, hinted that such retro-technology might sell better than the current PS/2 line. "[With the Model 30 286] we realized we could do a better job of responding to the unique requirements of the past," Thomas said.

ILLUSTRATIONS BY MARC ROSENTHAL

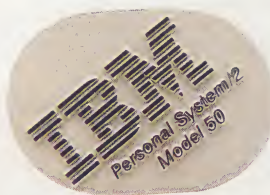
### A Great Laptop for the '70s

The IBM PC Convertible, introduced in 1986.



### The Boy Scouts' Uniforms Are Cooler Looking, Too

Macintosh product manager Jean-Louis Gassée, who spoke on company culture at the annual PC Forum in February: "What's the difference between Apple and the Boy Scouts? The Boy Scouts have adult supervision."



### Stupid Computer Trick No. 1

The serial port on the IBM PS/2 Model 50X, which works—as long as nothing is connected to it.

PHOTOGRAPH BY HERB BETHONEY

### Daddy, Can We Use Your Excel Box for a Clubhouse?

In addition to the disks and manual, here's what fits into the Microsoft Excel box:

- A dozen extra floppy disks
- A copy of Excel in Business by Douglas Cobb (1985, Microsoft Press, 673 pages)
- Sushi for two
- A bottle of Chateau Ste. Michelle Chardonnay
- Lotus 1-2-3, complete with disks, manuals, packaging, and upgrade.



PHOTOGRAPH BY HERB BETHONEY



### Columns We Wish We'd Never Started, Part 1

PC Week, April 19, Joe Mohen: "ISDN is really going to be an adjustment for those of us who grew up in the Information Age..."

### Columns We Wish We'd Never Started, Part 2

PC Week, June 21, Joe Mohen: "When I was a kid, my dad had a station wagon..."

### Columns We Wish We'd Never Started, Part 3

PC Week, May 31, Joe Mohen: "In 1978, my brother Jimmy and I took a trip out West..."

### Columns We Never Started, Part 1

PC Week, March 29, Joe Mohen: "This is the first of a three-part series on some recent experiences I had connecting an IBM mainframe directly to a Token..."

### Columns We Never Started, Part 2

PC Week, April 5, Joe Mohen: "This is the second installment in a three-part..."

### Columns We Never Started, Part 3

PC Week, April 12, Joe Mohen: "This is the last of a three..."

### Columns We Never Finished, Part 1

PC Week, August 15, Joe Mohen: "Last week we took the first steps in installing support for X.25 on a large IBM mainframe, using the software package called the Network Packet Switching Interface, or NPSI. As we resume our story, I'm about to add NPSI to my NCP generation..."

### Columns We Never Finished, Part 2

PC Week, August 1, Joe Mohen: "Let's face it: most connectivity manuals are dull. At times, I find reading them painful. I kept this in mind when I recently wrote a software technical manual. Determined to make it lively, I incorporated Star Trek characters into the examples. I expected to get a flood of compliments but, instead, I was besieged with complaints that the manual was 'childish.' Convinced that the data processing world is full of inane bores..."

### Columns We Never Finished, Part 3

PC Week, June 14, Joe Mohen: "Are you impressed by polysyllabic words? I know I am, almost as much as I am by acronyms. The connectivity business is lots of fun..."

### Bargain of the Year No. 1



In June, IBM offered dealers a \$1,150 subsidy for each AT traded in by a customer upgrading to PS/2—about a third of the AT's value on the used-equipment market.

### Bargain of the Year No. 2



In September, IBM extended the trade-in program to December 31—but it also introduced a new PS/2 model, the 30 286, which is remarkably similar to the AT.



### Macho Geek

It passed unnoticed in the year-end rush to get out of 1987 and into something that made sense. But an attendee at PC Tech Journal's System Forum last year finally explained why Macintoshes are sissy machines. According to Daryl Plummer, "Real men don't use icons."

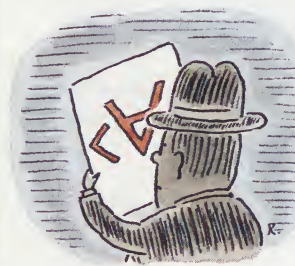
### Marketing 101, Part 1: If It Ain't Got That Swing

After six months of marketing and a steady buildup in the press, Lotus killed Modern Jazz on the brink of its introduction.



### Yes, But Do They Know What "TRS-80" Means?

According to John Roach, Tandy Corporation chairman, "Our research indicates that a vast number of people don't know what 'A, greater than' means."





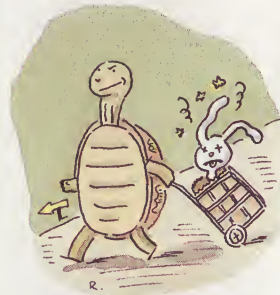


## Marketing 101, Part 2: Never Finish in Third Place If You Can Buy Second

When challengers Excel and Surpass leapt ahead of Borland's Quattro spreadsheet in the race to challenge Lotus 1-2-3, Borland bought the Surpass technology and the development team.

## The Perfect Machine to Run Evaporated Ware

In the September issue of PC/Computing, we enthusiastically reviewed the Dell 100, an 8088 PC, whose sharp monochrome VGA display and small size made it an ideal student and home computer, we said. But by the time the magazine went to press, Dell had announced it would not manufacture the Model 100.



PHOTOGRAPH BY HERB BETHONEY

## No Wonder They Canned It

Our article examining the Dell Model 100 revealed that the computer had a whopping "64K" of memory, which was a measly 576K short. Was our face red.

## Another Great Laptop for the '70s

The IBM PC Convertible II, introduced in 1987.



## Yet Another Great Laptop for the '70s

The Amstrad PPC 640, introduced in 1987.



## One Thousand Miles Off Course, But Making Great Time

At the Uniform trade show for Unix products in February, IBM announced several improvements in AIX, its version of Unix for the PS/2 Model 80. If the crowd failed to go wild, it was probably because AIX wasn't due to be available—improved or otherwise—until September. Of some year or other.

## Has the Harvard B-School Heard About This?

IBM vice president George Conrades was asked about delays in the shipping date for OS/2 Presentation Manager: "We're using a new management system," he said, then folded his hands in prayer and looked skyward.



## Great, But Can She Network?

The September cover of PC Resource featured a young woman springing into the air. With her skirt up to her black-stock-clad thighs and her arms raised, she must have been excited about the magazine's Rx for a sluggish hard disk.







### Ad Campaigns We Used the Channel Zapper On, Part 1

AT&T's "slice of death" commercials, shot by Leslie Dektor, in which stressed-out yuppies struggle with computer buying decisions. Give us a break, guys.

### Ad Campaigns We Used the Channel Zapper On, Part 2

IBM's commercials featuring the cast of "M\*A\*S\*H," in which former Atari pitchman Alan Alda spouts OS/2 lingo. Hawkeye sells out—again.

### Ad Campaigns We Used the Channel Zapper On, Part 3

Wang's jargon-spouting, disembodied voices. What's it all mean? Not much.



### Vaporware Redux, No. 1988

dBASE IV, Lotus 1-2-3 Release 3, and SuperCalc 5. We saw the ads. We heard the hype. We watched the ship dates come and go. And we won't believe their promises again.



### Stupid Computer Trick No. 2

Sir Clive Sinclair introduced his Z88, the smallest and lightest laptop available anywhere. Unfortunately, the Z88 isn't compatible with anything.

### Finally! A Great Laptop for the '70s

The Compaq SLT, introduced in 1988.



### Excuse Me, Americanski, Would You Hold This Gun to Your Head While I Get Out My Wallet?

A Soviet delegation of computer scientists visited the United States to appeal for an easing of trade restrictions on computer equipment bound for the USSR. The reason for the appeal? Without American computer technology, says Vladimir Korov, "Our weapons will not be reliable, and we may make a mistake." Ah, glasnost.

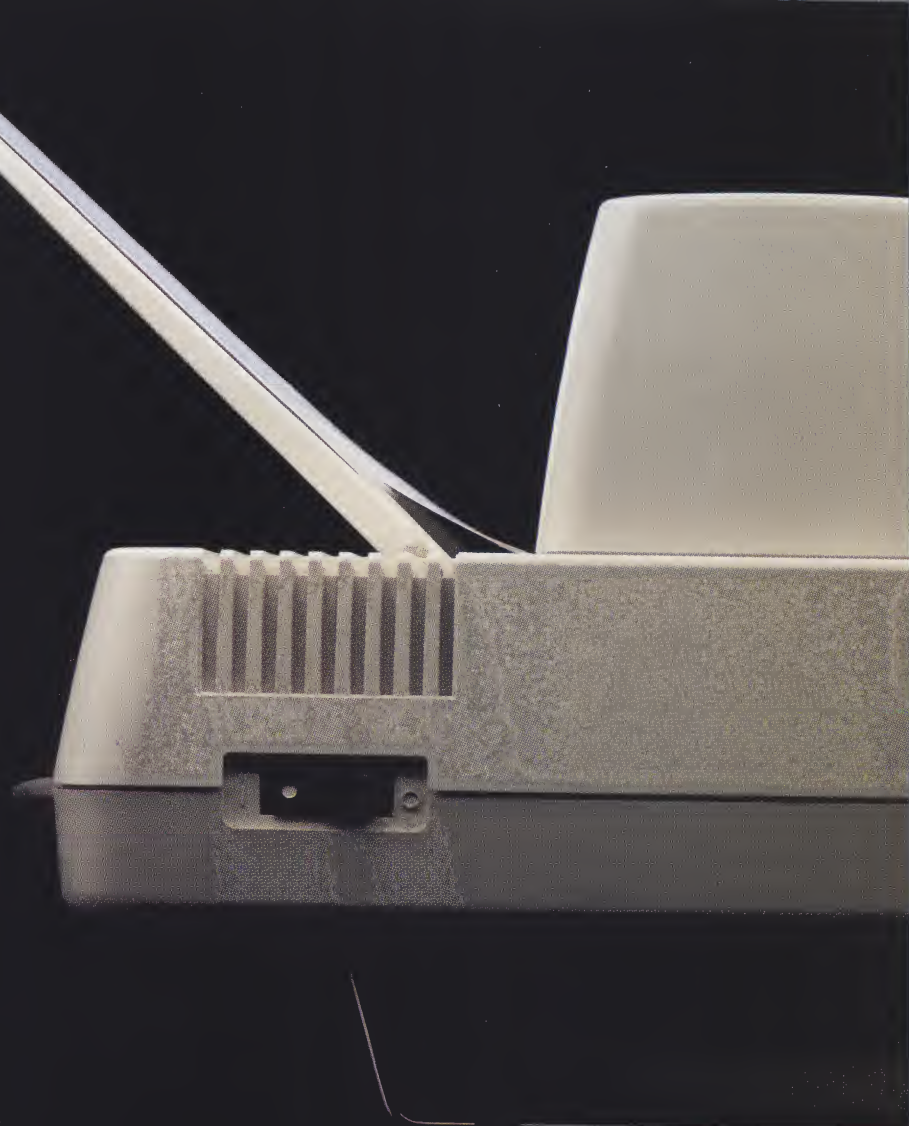
### What About New Year's?

The headline on the ad for the Logitech ClearCase Mouse reads, "Get naked for Christmas." Not only does the line have nothing to do with the copy of the ad—except for the fact that the company is marketing the mouse in a transparent case—the ad ran as early as October. What about Halloween?



At least for this year, the verdict is in. As for the coming year, you be the judge.  
—The Editors





# THIS IS WHAT HAP LET OUR CUSTOMERS

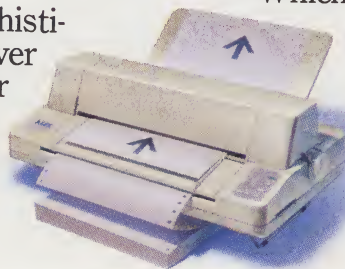
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rugged 24-pin printer for under \$500. Which the Allegro 24 is. You wanted it to churn out page after page of crisp, letter-quality output. Which it does. And you wanted it with easy-to-use front panel controls. Which, of course, it has.

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THE EXECUTIVE PC:

# A NEW LIGHT ON BUSINESS

**A**fter years of acknowledging that it makes sense for top executives to use PCs, America's corporations are finally finding practical ways to make it happen.

Few technology planners question the benefits of PC use by top-level managers. The PC is the best tool yet devised for delivering and analyzing the information that executives need to survive, and enthusiastic computer use by top management can promote more effective use of PCs throughout an

organization.

Yet computer-using executives remain a minority. Less than 15 percent of CEOs at the country's top 1,000 companies have workstations in their offices, accord-

cations simply aren't targeted to executives' needs.

Top managers rarely generate or process data. They don't pound out word processing documents or crunch spreadsheets—their subordinates take care of those tasks. But some companies are discovering that the computer can serve as an intelligent searchlight for top management, quickly spotting crucial information amid the numbing fog of data that blankets most organizations.

"In today's environment, a businessman operating without access to good information is playing with one hand tied behind his back," says Robert G. Wallace, president of Phillips 66, the plastics- and chemicals-making arm of Phillips Petroleum. Wallace attributes the sterling performance of his company—which boasts a higher return on sales and return on assets than any of its competitors—in part to his and his colleagues' regular use of computers.

Indeed, the enthusiasm of executives who do use PCs belies their small numbers. Wallace, for instance, believes that greater—and more intelligent—use of computers by top management could solve many of the chronic problems of American business. He says that too many senior managers are "sitting in the dark like a bunch of mushrooms," closeted from the facts that shape the competitive environment.

## The Right Stuff

For a computer application to be truly useful to a busy executive, it must be designed from the very start with an understanding of how top managers

**At last the PC is becoming an intelligent searchlight for top executives with the vision to take advantage of it.**

**By HERB BRODY**

ing to research compiled by David DeLong, coauthor of *Executive Support Systems*.

A number of obstacles have prevented widespread use of PCs by executives. Some problems—the inability of many businessmen to type, or their unwillingness to devote time to mastering computer systems—can be overcome by intelligent technology choices and application design. But one stumbling block has proved especially stubborn: most PC appli-

ILLUSTRATION BY ALAN COBER







function and what kinds of information they need.

Top executives spend much of their time identifying and reacting to trends rather than dealing with the details that create those trends. The best applications for executives recognize this fact. Most feature some sort of exception reporting that automatically highlights pieces of data that stray from expectation. In a table of sales figures, for example, the computer might display in red any number that varies from budget by more than a predetermined amount.

According to Chemical Bank senior vice president for finance Richard Scurry, who is spearheading the bank's introduction of executive PCs, the point "is to make the machine search through lots of data for the particular information you want, according to criteria you set, and then graph it. I want to be able to look for any number that's more than \$10 million off what we want it to be, for example, or for any measures of company performance that are getting worse."

The emphasis on trends and summaries puts a premium on heavy use of eye-popping color graphics—*USA Today*-style presentations that contrast with the gray pages of the traditional briefing book.

**Strong support from top executives—perhaps even a mandate—may be required to convince other high-level managers to use computers.**

Of course, a manager also must be able to peel back the spiffy graphical veneer and get to the underlying numbers. If a summary chart shows that company-wide sales are off budget, for example, the click of a mouse could bring up a screen that breaks the figures down by product category or geographic region. "I can see at a glance what areas of the business are OK and what is heading off in the wrong direction," says Joseph R. Galassi, executive vice president for operations at Burlington Northern Railroad. "I can nip problems in the bud."

Executive applications are most effective when they supply the small subset of information that really matters to the executive rather than inundating him with details. Most such systems let the businessman scan a checklist of "critical success factors," such as revenue, profits, and production costs.

"I can go through lots of data, then have the computer graph just the set of numbers I'm interested in," says Robert Schoonmaker, controller and trea-

---

*Herb Brody is a senior editor of PC/Computing. Formerly an editor of High Technology Business magazine, he has written extensively on corporate attempts to gain a competitive edge through technology.*

surer of Southwestern Bell Telephone. "Computers reduce the time it takes to get the data I need to manage," he says.

To foster accountability among the staff feeding data into the system, names and phone numbers of the information providers appear on the screen in Southwestern Bell's executive applications. The knowledge that top managers can easily check on what's happening has "brought more discipline to our financial organization," says Schoonmaker.

Indeed, one of the most important benefits that a top manager can derive from access to a computer system is the warts-and-all picture of his organization and the people in it. As the chief executive of one British company puts it, "I want enough information to be dangerous."

**Get the Data Now**

Quick access to an objective picture of a company's performance is most important when business conditions can change radically from day to day, such as in financial firms. Although they still leave the detailed analytical work to their subordinates, many high-level financial managers are using computers to cast valuable light on business operations. Recently, for example, leaders at Midland Montagu were concerned that their banking company was not doing as well as hoped. With the computer system, says head of finance Glenn Miller, "we could see right away that the shortfall was coming from the company's new ventures, while its core activities remained successful."

Such fast-paced companies find traditional methods of delivering information to the top hopelessly sluggish. At Bank of Boston, executive vice president and head of world banking Clark W. Miller welcomes the computer system's "quick and easy access to information, with minimal complexity. I can find the information myself, instead of having an assistant dig through a bunch of filing cabinets."

That sense of urgency prevails in other industries as well. "When I need to know something, I need it right away," says railroad executive Galassi. "I don't have time to go through somebody else."

Similarly, during this summer's scorching nationwide heat wave, desktop computers gave jittery power company executives an instantaneous look at how well their generating plants were holding up against the record demand. Officials at Georgia Power Company, for example, were glued to their screens much of the day during the peak of the crisis.

**A Strong Hand at the Helm**

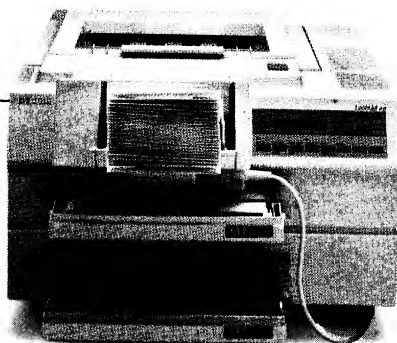
Quick information access can also help polish an executive's image—and that of his company—in the eyes of investors, customers, union officials, or reporters. Schoonmaker, for instance, uses his computer to bone up on company statistics before facing a



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Standard & Poor's meeting. "I used to have to call up my staff and have them round up all the data," he says. "Now I get it myself—me and my mouse."

Producing instant answers impresses important visitors, too. The former president of Lockheed Aeronautical Systems, Robert Ormsby, could use his computer to call up a screen showing the whereabouts of each airplane under construction in the company's huge plant. These are big-ticket items—the cheapest model sells for \$20 million—and visiting customers like to see that the man in charge is personally looking after their plane. After leaving the office, the reassured customer can be taken to the location indicated by the computer—the paint shop, perhaps—and voilà, there's the plane. This creates a powerful image of having everything under control.

Similarly, a computerized executive suite can lend a company a certain technological cachet. In 1986, for example, Southwestern Bell president John Hayes decreed that the officers reporting to him start using a computer system; computers are an image imperative for a telecommunications company, he insisted.

Such strong support from top executives—perhaps even a mandate—may be required to convince other high-level managers in the organization to use an executive computer system. When Robert Ormsby was at Lockheed Aeronautical Systems, he encouraged top management to use computers by distributing his action memos on the company's electronic mail system; anyone who didn't log on found himself sailing without a rudder.

Galassi played the role of chief sponsor at Burlington Northern. "Once I started using the system, there was no problem in getting others to use it," he says. "People would say to themselves, 'How come he knows what's going on at seven in the morning when I have to wait till nine for the printout?'" In fact, Galassi believes that computer systems introduced at lower levels of the company would "die on the vine" without executive endorsement.

Public Service Electric & Gas of New Jersey set up an executive software package in January 1987. "It went nowhere" for most of that year, says Arde Rostami, manager of office and client systems. "Then we connected with the chairman—now we're on a roll."

Once a top manager becomes actively engaged with the information system, enthusiasm tends to

#### ROBERT SCHOONMAKER



**“ I USED TO call my staff and have them round up all the data. Now I get it myself—me and my mouse. ”**

spread to all the people reporting to him, then to their direct subordinates, and so on down the line. "It's a fact of life," says Galassi. "If you know your boss is watching something, you're going to want to watch it too."

A more tuned-in top management can also bolster employee morale. Phillips 66 president Wallace says he frequently dashes off notes to employees to acknowledge a job well done. Such computer-aided stroking takes a lot less time than the friendly phone calls that executives have traditionally relied on.

It works the other way too, though. Executives at The New England, a diversified financial services

PHOTOGRAPH BY GREG STROBI



company, use computers to track performance at the company's 90 field offices. Every quarter, office managers are evaluated according to a dozen or so criteria. The computer presents a brutally clear report card. One manager who came in for review earlier this year resigned on the spot after seeing his work record analyzed, according to Vince Ficcaglia, second vice president of the insurance and personal financial services division.

### The Price of Power

A mini-market has emerged in PC applications that are targeted to the needs of top management. Pilot Executive Software, for example, has made an entire

mander EIS. With the Comshare system, however, data can be downloaded into the executive's PC, where it can be summarized, scanned, and charted. This approach avoids the sluggish response that can frustrate users of time-shared computers.

Other companies focusing on the executive market include the Execucom Systems Corporation, known for its mainframe software products, and Information Resources, Inc., which offers both mainframe and PC-based systems. It's also possible to cobble together an executive-ready computer from existing database, electronic mail, and office automation products. Although most of these systems don't have easy-to-use graphical interfaces, special-purpose software tools, such as the Easel from Interactive Images, can be used to make them more accessible.

Because they require mainframe hookups, the Pilot and Comshare approaches to executive computing typically cost \$1 million to \$2 million. A less expensive alternative is to forgo the mainframe altogether: most of the basic functions an executive needs can be provided with a network of PCs, one of which acts as a file server. Cadet Executive Information System's Cadet system, for example, can be set up for under \$300,000.

Users say that's a small price to pay for something that greatly improves executives' ability to make decisions. "Cost is irrelevant," according to Richard Scurry of Chemical Bank. "These guys make a lot of money. Something that gives them better access to critical information is worth a lot."

Exactly how much is a question no one seems able to answer. The value of executive computing is more intuitive than it is measurable. Virtually no one who sells,

uses, or studies executive computing can put a dollar value on its benefits. "The payback is there—it's just hard to identify," says Burlington Northern's Galassi. He uses a computer to check on whether rail cars are hauling enough tonnage, whether there are any traffic tie-ups, and other variables. "You have to

JOSEPH R. GALASSI



**“ I CAN SEE at a glance what areas of the business are OK and what is heading off in the wrong direction. ”**

business out of selling what it calls executive information systems. Pilot's system summarizes and graphs information from a mainframe database. The user works interactively with the mainframe, using the PC as an intelligent terminal. Pilot's chief rival, Comshare, Inc., offers a similar system, called Com-

PHOTOGRAPH BY HOLLIS OFFICER





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look at the cost of *not* using the system—the opportunities missed for lack of clear, up-to-date information.”

### Taking the First Step

Even after a company decides to invest in an executive application, there remains the problem of getting top managers to use it easily and effectively. Right now, most of these applications emphasize ease of use because many executives lack the time and motivation to learn a complex set of procedures that they will typically use only a few minutes a day.

“Executives are very unforgiving,” says David Mitchell, a former vice president of AT&T, now deputy comptroller for financial management systems at the General Services Administration in Washington. “They become impatient with 30-second delays while the computer performs a search for information that might previously have taken days. They want to use the computer as if it were a telephone.”

In an effort to make computer systems more approachable for executives, developers often design the systems so that they require little keyboard use, relying instead on a mouse or touch-screen to select options from screen menus. This style of computing jibes with the nature of executive work.

Even today's active PC users in the executive suite acknowledge that they approached computers with some anxiety. “I don't like to dabble with computers—they're more intimidating than anything else,” says Bank of Boston's Miller. At Lockheed Aeronautical Systems' Georgia division, director of financial operations Abe Kassis says that for a computer to be useful for him, “it has to be idiot-proof.”

**The value of executive computing is more intuitive than measurable. Virtually no one has been able to put a dollar value on its benefits.**

Kassis's concern is shared by the vast majority of successful people of his generation. But the next generation of managers will have different needs. Virtually all of them use PCs in their work. They are not burdened by the attitude that “keyboards are for typists.” As these people rise to the top ranks of business, some of the distinctions between executive computing and everybody else's computing may begin to blur. ■

### List of Poor Excuses

- 1) “I forgot.”
- 2) “I never know what to do next.”
- 3) “It's too hard to understand.”
- 4) “I didn't think I needed to.”
- 5) “I never have enough time.”

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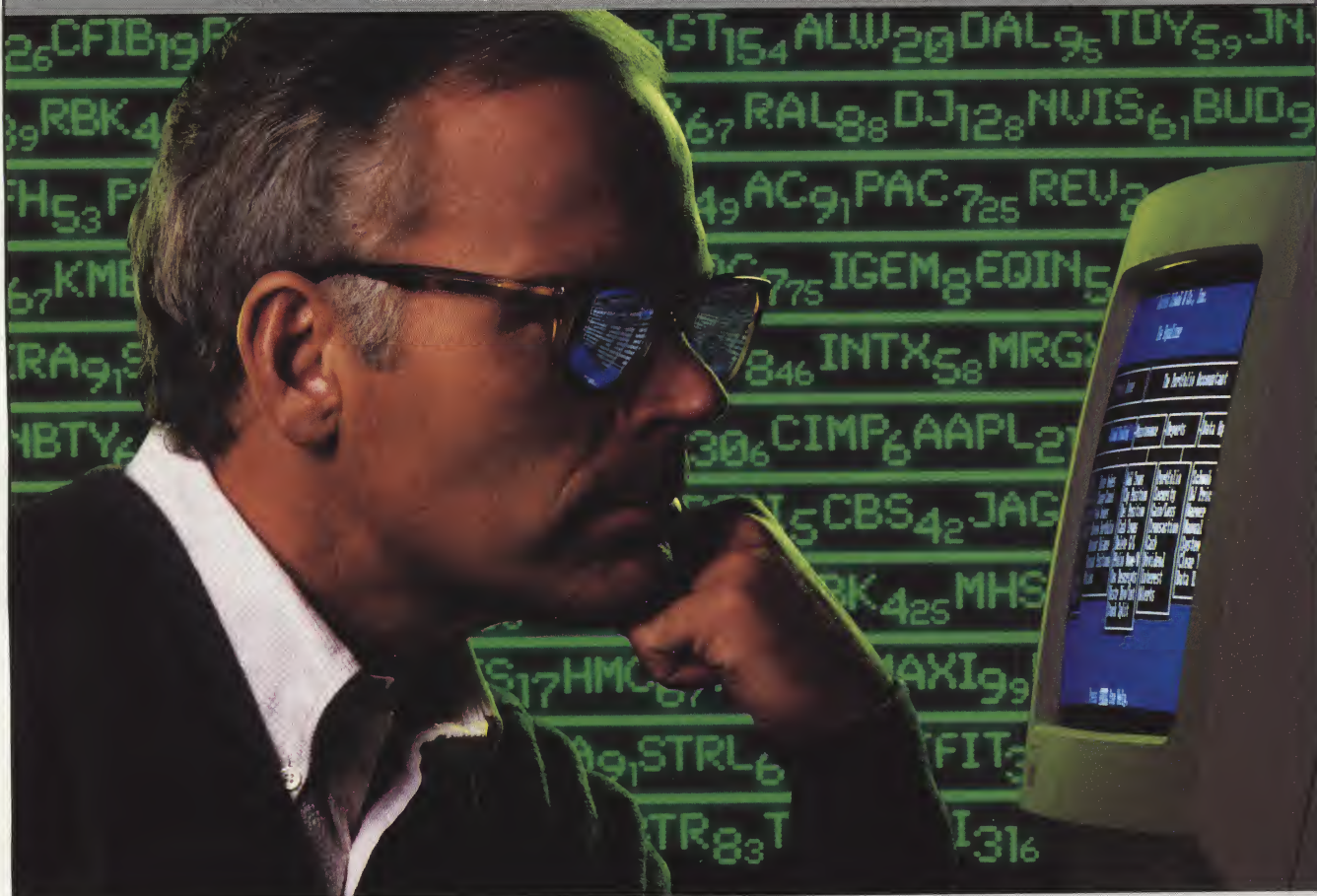
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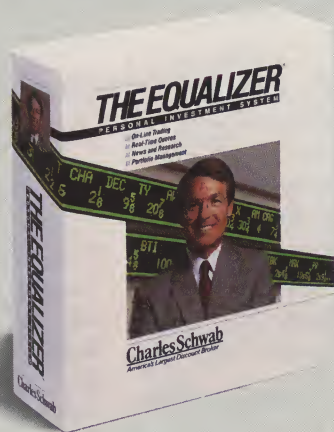
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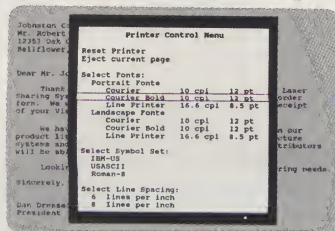
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# Awards for True Vision

**The computer lets the true visions  
of these 1988 winners come shining through.**

**By CAROL OLSEN DAY**

A rose in full bloom, sunlight on a table, faces in reflection. These are some of the visions of the winners of the Truevision Art Contest, visions that were rendered by a new medium for creating art: the computer.

When artists are working with rich patterns, images, colors, and light, they need tools that can keep pace with their visions. To put those kinds of tools in the hands of new computer artists, Truevision (an Indianapolis-based microcomputer videographics company that grew out of work at AT&T Bell Laboratories) awards the winners of its yearly computer art contest with state-of-the-art hardware and software.

This portfolio showcases the work of the 1988 winners in the still image categories. To be eligible, the work had to have been created using a Truevision videographics adapter like a Targa graphics board.

The artists speak for themselves here. Much of what they say is summed up in the words of Philip High, whose work was judged best of show: "Computer graphics is an intriguing combination of technology and creativity. It's the best of both worlds."

In some ways, the work of the winners is the best of both worlds too.

## Thread

I was intrigued by the possibilities of crossing the apparent boundaries of both the computer and traditional techniques and in integrating the two approaches. So in the spring of 1988 I

obtained a Targa 16-based graphics system: an Acer 900 computer (a 286 AT compatible with a 1.2MB floppy drive and a 40MB hard disk), a Boca-RAM/AT board with 1MB of extended memory, a Summagraphics SummaSketch Plus drawing tablet, a Mitsubishi 13 color monitor, a Howtek Photomaster slide scanner, and a Targa 16 videographics adapter. Datastream Imaging Systems, of Lexington, Kentucky, put the system together for me. I output my work at the Datastream Imaging Center using a Lasergraphics MFR at 6,000-line resolution.

Using TIPS software, I began experimenting to create this work. After deciding on the Paint and Brush style, I used the Brush Edit feature to create a set of custom brushes resembling the default shapes but consisting of random dot patterns. Working directly on the screen and using the Straight Line tool, I drew in the basic window construction.





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*Philip High, Knoxville, Tennessee*

To color and light the planes, I used the Fill and Spread features, modifying the palette as needed. Then I grabbed and dragged the pixels to get a mingled paint and brush stroke look, sometimes using Tint or Blend for more subtle effects. One of the most powerful tools I used was the Move feature, making major adjustments without having to start over.

I scanned in the rose from a slide

and then repainted it using Grab. After I painted in a transparent black background and saved it as a window, I loaded the rose into the picture, using Frame to flop, resize, and move it into place. I drew in the thread last and then made final adjustments to the entire image, often pixel by pixel, taking advantage of Pan and Zoom.

I worked on the piece intermittently for about two months; it was essentially a first-time learning experience.

The final image evolved during the process of solving the visual problems. It came to represent a recurring theme in my work: a common thread that unites apparently unrelated elements or circumstances—like art and computers.

—Philip High



# 1 Fine Art Rustic Series



*Bob Sanders, Ilford, Essex, England*

For an initial investment of about £14,000 (about \$23,000), I bought a Tandem computer, a Targa 16 board, a Hitachi 19-inch monitor, a JVC camera for input, and AT&T Graphic Software Labs' TIPS software. I send the images to an independent studio where they are made into slides or printed hard copy.

To get to the point where I could do this piece, I spent a year locked away in my studio. With no previous training and no connection in the computer world, I was experimenting all the time. So many different styles and images came to me. The computer is such a completely different medi-

um—I'm still not sure which direction to go in. This piece is quite different from most computer art, since I used traditional images with nontraditional materials.

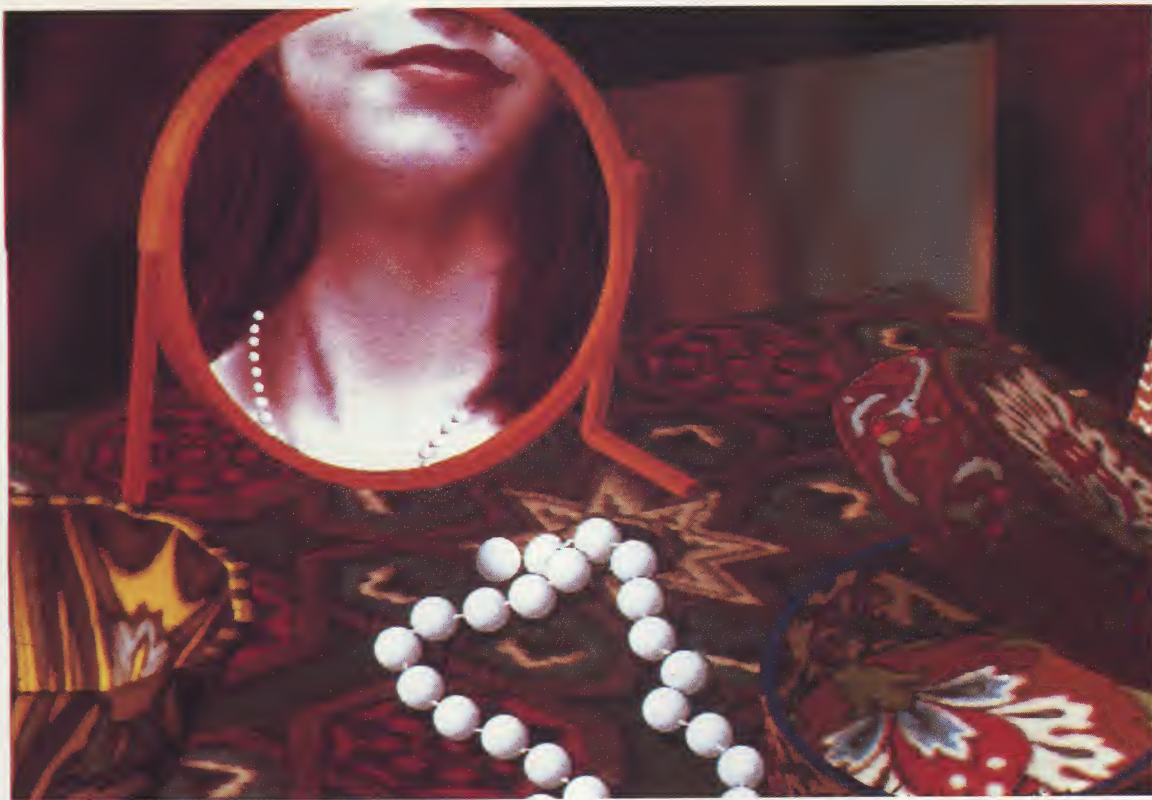
What's good about using the computer is that you can get an image down fairly quickly, and then make changes in color and composition. Plus, being able to create so many variations so easily is terrific. The drawbacks of the computer are that the pen and digitizing pad do not af-

ford as much control and are not as sensitive as other media.

Originally, I saw the computer as a way of getting a sketch down and then creating it as a silkscreen. [*Christie's is publishing the limited-edition silkscreen print that Sanders created based on his computer rendering.*] But now I want to go from computer image directly to print, especially because working the computer image into a silkscreen took about three months. In the process, I lost the computer feeling of the work.

I'm still in the experimental stage of using a computer. Every day brings something new. —Bob Sanders





*Alan Waxenberg, Brooklyn, New York*

## 2 F i n e A r t The Pearls

It took me about 11 months to create this piece, in a series of stages, the same way an etcher would work. The difference between what I did and what a traditional printmaker would do was that with the computer, I could work in a three-dimensional world, one in which I was able to move the images around any way I wanted them.

Even after I've created the image I want, I'm not finished. I can enhance the work using AT&T's TIPS or Networked Picture Systems' Image Express software. The computer lets me change the colors or color values and retouch the image.

I went through five stages to create the final image: the table, the mirror

without the reflection, the pearls, the Tiffany glass, and then the image reflected in the mirror. I used a Targa 16 board in a 386 computer with a Mylex motherboard, 80MB hard drive, and 5MB RAM, and a Sony Multiscan monitor and Summagraphics tablet. I output the image to videotape using the Matrix high-resolution film recorder. (My system cost about \$40,000.) In addition to TIPS and Image Express, I used AT&T Graphic Software Labs' TOPAS and RIO.

I believe computer art is an art form, much as photography is. But computer art is also much different from the traditional art forms. An extremely fluid, transient means of expression, it lets you create a world and position yourself anywhere in that world. You can also use and incorporate time and space in your work. Ac-

tually, the computer offers the artist an opportunity to develop a new vocabulary.

Developing an individual style is much more difficult with computer art than with traditional art forms. First you have to work through all the jargon and procedures of the software, and then you must develop a personality that's unique as an artist. Otherwise, you're only illustrating another art form. If you're doing a painting, why not just do it on canvas?

The computer is a new medium with no fixed rules. That's what I find most exciting. —Alan Waxenberg



# 3

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## Dreaming

Using a Targa 16-based graphics system with TIPS software, I brought the image of the woman into the computer with a composite camera, then I altered the background and her hair, features, and clothes. Next I did some experimenting with transparency effects and color.

My work is quite different from one image to the next; sometimes I manipulate captured images, and other times I render the entire image on the computer. I recently produced a limited edition print that was rendered entirely using the Management Graphics System.

When I do silkscreens, I usually work with photographs. But the computer lets me do even more with the photo, and do it faster. I can use a photograph that I input into the computer image; in one piece, I can make a collage that appears to be made of many different media—photograph, silkscreen, computer—rather than just one.

What I really appreciate about using the computer is that it gives my work more spontaneity and more flexibility. It's so easy to edit with the computer. You can't really edit a silkscreen once you've printed it, but you can change a computer image as many times as you like, developing it in many directions. The process is so flexible, so spontaneous, so creative—and that's important for an artist.

—Cheri Smith



*Cheri Smith, Brighton, Massachusetts*





*Linda Prosh, Toronto, Ontario*

# 1 Old Cars

Commercial Art

For this work I used a Compaq 386 with a Targa 16 board, an Electrohome high-resolution monitor, a Summagraphics pad, and a Howtek color laser scanner, with Time Arts' Lumena software. Even though I used high-tech equipment, my goal was to create something that didn't look like the typical high-tech computer graphic. I was trying to emulate the look of mixed-media magazine illustrations.

I built the image by scanning in

photographs from a variety of sources—calendars, magazines, catalogs. The frontal view of the car came from a calendar. I scanned it in and then used a Lumena brush to produce the stippled effect.

All the smaller elements were put in as cells. I faded in two of them and placed in the others. The car in the top left was painted through buffers. If you have two buffers in Lumena, you can paint through them transparently. I also used Lumena's complementary color settings.

As an illustrator, I had done mixed-media work without using the com-

puter. But using the Lumena's cut-and-paste feature to create a mixed-media effect is so much easier and cleaner than using the actual photographs, paper, paste, ink, and paint. Even though I've been involved in computer art and graphics since before PCs, creating the look of mixed media with a computer was a great learning experience. —Linda Prosh



# Chardonnay

I wanted to create an image that incorporated elements of illustration and photography. I started with a photograph I had shot several years ago for my portfolio, of a wine bottle and opener over a background of a full wine glass. I scanned the photo using a Howtek scanner, which gave me a Targa file.

Then I "painted" the background, using Time Arts' Lumena software together with GSL's RIO. Together these packages give me the ultimate in flexibility and control.

The final step was adding the grapes. First I arranged actual grapes in front of a video camera and taped them. The next step was to grab a frame of the videotape on the computer. I then composed the image using RIO. Finally, I "painted" the grapes into the background using RIO and Lumena.

I output the image on a Matrix PCR film recorder. The total processing time was two days.

Using the computer in this way has helped me to add a unique style to my work. It has also enabled me to carve out a market niche for myself. That way, I've been able to reduce the pressures of competition. —Steve Keller



*Steve Keller, Pasadena, California*



# Eyetech

We used the Targa 32-based system at Western Imaging in Mountain View, California, where Terry is a production artist. I was able to create the image in a high enough resolution to make the idea work aesthetically as well as conceptually. Although I had not used Lumena in the 32 version, I had worked for a few months with Lumena/16. In fact, the first image I did for the job was done in 16-bit resolution; it was a man's eye, and it looked older and more sagacious than the final image. But the client wanted to use a woman's eye, which was produced with Lumena/32.

That's where Terry stepped in, since he had been working with Lumena/32 since March 1988. He contributed so much to the design in the form of "discovered" effects (notice the star in the pupil) and ways to accomplish what we wanted that we were able to meet the deadline while still exploring the full possibilities of the medium.

We began by inputting a Howtek-scanned image of an eye. Then we used image processing to "erase" the halftone on the original and to retouch and enhance it. My heart fell

when I "crashed" a third of the image, but then I realized one of the advantages of using the computer. I grabbed a palette from my original Targa 16 file for the probe array in the pupil and saved a lot of time. With a trick Terry discovered—blending to the white background—we were able to take advantage of the fine 32-bit resolution and color that Lumena can produce.

The deeper I get into the image and explore the possibilities of this medium, the more evangelical I become. As an artist, I have now lost the horizon of what is possible visually. With the computer, artists like us can explore the seemingly infinite potential of imagery.

—Garrett Moore



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*Garrett Moore and Terry Grieves, Fremont, California*

*Carol Olsen Day is features senior editor of PC/Computing. Her most recent look at computer art in Portfolio featured the work of Barbara Nessim. Day indulges her longstanding passion for art when she's at home in New York, especially in Soho and Tribeca, where she lived during the heydays of those artist enclaves.*



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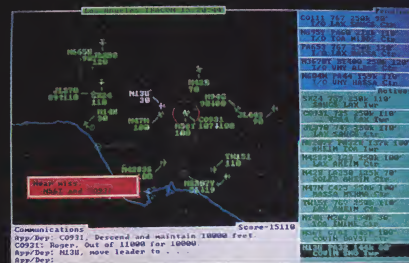
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# risc

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**By WINN L. ROSCH**

**R**ISC. It sounds like a miracle drug, and its promise is equally wondrous: with RISC, a personal computer can be fast and powerful enough to outperform a mainframe, and a mainframe might make the prophecies of science fiction seem modest. The consensus among the scientific and engineering communities is that RISC will be central to all computer designs of the future. In fact, a RISC-based desktop computer with the power of an IBM mainframe may be just two years away.

But RISC, which stands for reduced instruction set computing, is nothing you can inject into your PC for an instant power boost. It isn't a product or a technology. Rather, RISC is a design technique, a philosophy that engineers follow when they lay out the inner circuitry of a microprocessor or the webs of wiring that make a mainframe. It represents a fundamentally different way of designing computers, one that will unleash ever-greater speed.

Although RISC is destined to be part of future personal computers, you won't encounter it in any machine that runs DOS or even OS/2; RISC is inherently incompatible with those operating systems. Only with elaborate software tricks that subvert the goal of RISC processing—fast raw processing speed—could a RISC computer work its way through a Lotus spreadsheet or a Paradox database. In fact, the RISC philosophy is so radically different

from that used to design today's PCs that it will require a new generation of software to take advantage of its potential.

So what does this mean to you? Although you may never have to choose between a RISC machine and one based on some other design, RISC will influence the engineering of the next machine you buy—and nearly every other new computer. The fastest microprocessors now available are based on RISC, and some of its design tenets have influenced the circuitry of Intel's 80486 microprocessor (due for release in 1989), probably the next great DOS chip.

Computers based on the RISC philosophy range from IBM's RT system workstation to the Cray supercomputer. And the next generation of personal computers, machines beyond the PS/2, will inherit the RISC design. RISC will help them speed along at rates ten times as fast as the best 80386 machines.

### **The RISC Philosophy**

The term *reduced instruction set computing* is both descriptive and misleading. A RISC chip is designed to use a reduced instruction set. A computer's instruction set comprises all the commands that it can carry out directly in one step. A computer program is built from a series of these instructions. The RISC name identifies a machine that has been designed to understand fewer commands or instructions than the typi-





$$\begin{aligned} & \left[ \left( \frac{3!}{0! \times 3!} \right)^{1^0 + 1^3} \right] + \\ & \left[ \left( \frac{3!}{1! \times 2!} \right)^{1^1 + 1^2} \right] + \\ & \left[ \left( \frac{3!}{2! \times 1!} \right)^{1^2 \times 1^1} \right] + \\ & \left[ \left( \frac{3!}{3! \times 0!} \right)^{1^3 \times 1^0} \right] \\ & = 8 \end{aligned}$$

$$4+4=8$$



cal computers of the last decade or so—those now termed CISC (complex instruction set computing) machines.

No sharp line marks the boundary between RISC and CISC. For instance, an acknowledged RISC microprocessor, the 29000 from Advanced Micro Devices of Sunnyvale, California, has a full repertoire of 116 instructions. The 80386, a CISC microprocessor made by Intel, features 144 instructions. Although significant, the difference between the two is no watershed.

Slimming down the instruction set simplifies a computer's processing, and the instructions that remain are honed and smoothed to offer the least possible resistance to the passage of data.

The most important distinction between RISC and CISC is not how many instructions are used, but how

those instructions are realized. The RISC philosophy eliminates microcode, speeds up the instructions used most often by the computer, and creates a tighter bond between the machine and the compilers used to build the programs it runs. RISC designs exploit fast memory techniques like caching and pipelining. The RISC instructions themselves are more focused—each is designed to do only one thing—and more uniform.

Above all, simplicity is the key to the design of RISC machines and microprocessors. For example, while the Intel 80486 microprocessor will have the equivalent of about 1 million transistors, the RISC-based R3000 from MIPS Computer Systems has an equivalent of only about 100,000.

### Minimizing Microcode

Microcode is program code stored in ROM inside a microprocessor, or found as a dedicated part of a larger computer. Originally conceived by Maurice Wilkes at Cambridge University, microcode was intended to enhance the instruction repertoire of early

*Winn L. Rosch, a contributing editor of PC/Computing, demystifies hardware in his latest book, Winn L. Rosch's Hardware Bible, soon to be available from Brady Books.*

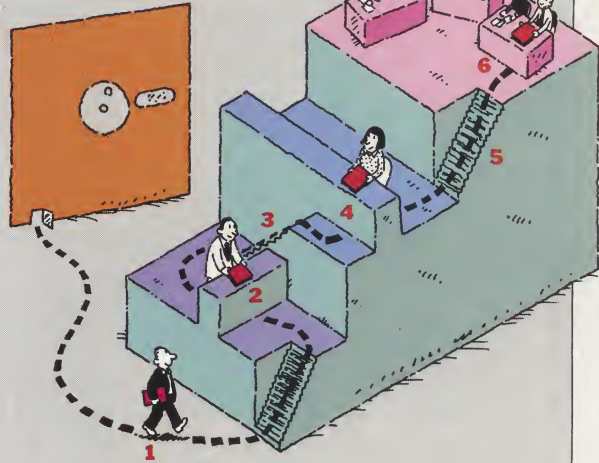
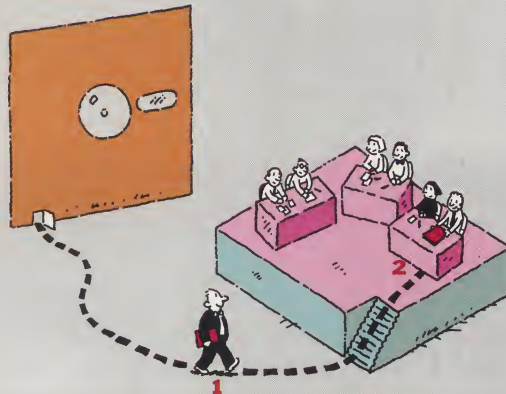
## The Simplicity of RISC

The primary difference between RISC (reduced instruction set computing) and CISC (complex instruction set computing) chips lies not so much in the number of instructions within each chip, but rather in how efficiently each of those instructions

is carried out. As the illustration shows, while it may take six steps to perform a certain instruction on a CISC chip, a RISC chip may do the same work in two, which accounts for RISC's far greater speed.

### CISC ▶

**1** The application software issues a command to a CISC chip. **2** The command is sent to a nanoprocessor, which is in essence a chip within a CISC chip. **3** The nanoprocessor interprets the command using the instructions in its microcode—program code contained in read-only memory that's part of the microprocessor hardware. **4** Using the microcode, the nanoprocessor translates the software's command into an instruction or series of instructions that can be understood by the chip. **5** This instruction is sent to the chip, causing it to do something, such as multiply the number in one of its registers by another number, **6** completing the actual execution of the instruction.



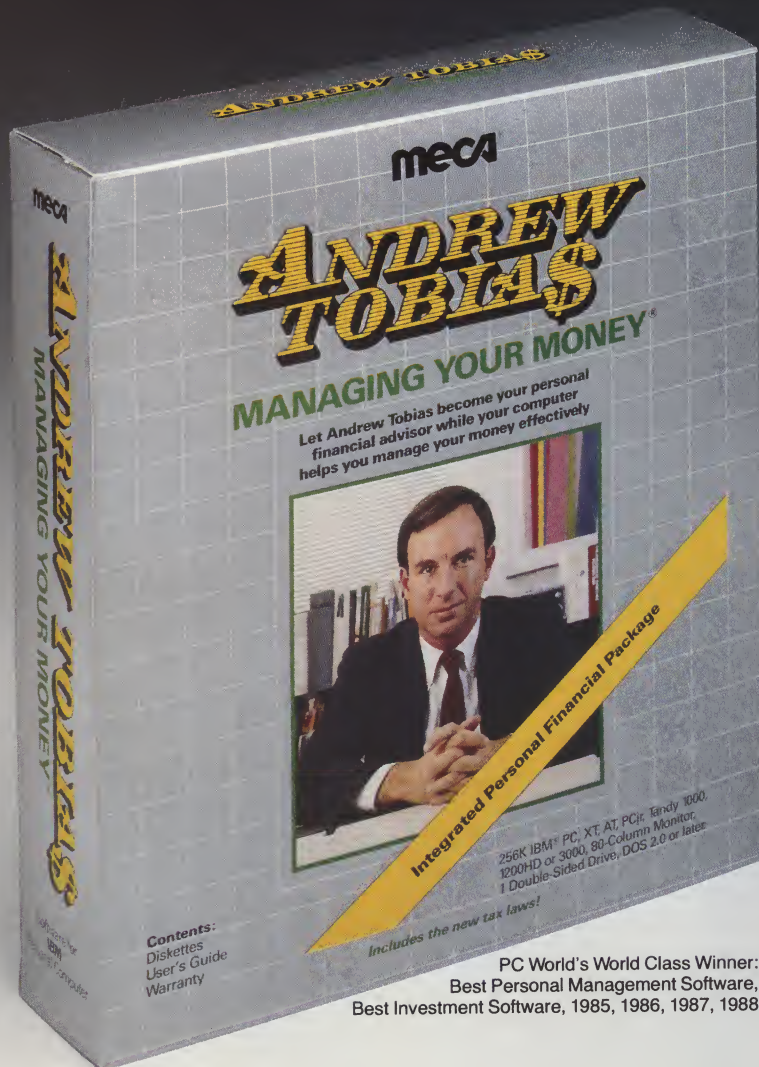
### ◀ RISC

RISC chips eliminate nanoprocessors and microcode. Instead, **1** the application software issues a command directly to the chip, which **2** executes the instruction.

ILLUSTRATION BY JIM CARSON



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mainframe computers by acting as an interpreter. The microcode program could take complex instructions and translate them into a form that a simple but powerful computer could execute. The program is executed by special data processing circuitry, which in a microprocessor is often called a "nanoprocessor"—essentially a microprocessor within a microprocessor.

This microcode-and-nanoprocessor approach makes it easier to create a complex microprocessor. The circuitry of the chip can be designed independently of the instructions it must carry out. The manner in which the chip handles complex instructions can be fine-tuned even after the architecture of the main circuits has been laid into place. Bugs in the design can be easily fixed by reprogramming the microcode instead of developing a new design for the whole chip—not a trivial task when the equivalent of a million transistors is involved.

But the approach imposes a penalty. As with any microprocessor, the internal nanoprocessor synchronizes its operation with the system clock of the computer. Each step the nanoprocessor takes requires a cycle of the system clock. Since one complex instruction might take the nanoprocessor several steps, each instruction the nanoprocessor interprets may require many clock cycles. The Intel 80386, for example, can take 43 clock cycles to carry out a single mathematical instruction.

The goal in RISC machines is to use as few cycles as possible for each instruction. For instance, the M/2000 computer from MIPS Computer Systems, which is based on the company's R3000 RISC chip, does not use microcode and averages about 1.2 clock cycles per instruction. Scientists believe that it may be possible to average as little as one-half cycle per instruction.

Besides slowing things down, the microcode-and-nanoprocessor combination complicates the circuitry onto which it is grafted. In a microprocessor, the ROM used to store the microcode and instruction-interpreting circuitry of the nanoprocessor can occupy much of the silicon that makes up the chip.

## A RISC Glossary

**CISC.** Complex instruction set computing. A computer technology that uses a large number of specialized instructions to carry out its programs. Each instruction requires several clock cycles to execute. To interpret these instructions, CISC machines rely on microcode. Examples of CISC microprocessors include Intel's 80286 and 80386. CISC computers include nearly all current IBM mainframe computers and DEC VAX minicomputers.

**Compiler.** A program that translates software code into machine language that a computer can understand.

**Instruction set.** All the commands that a computer can carry out directly in one step. RISC chips tend to have smaller instruction sets than CISC chips, but this is not the only distinction between the technologies.

**Microcode.** Program code stored in ROM inside a microprocessor. Microcode programs take complex instructions and translate them into a form that a microprocessor can execute.

**Mips.** Millions of instructions per second. A general reference point for gauging a computer's speed.

**Nanoprocessor.** Special data processing circuitry in CISC chips that executes microcode programs. RISC chips do not need nanoprocessors.

**Optimizing compiler.** A compiler designed to make sure that the code it compiles uses a computer's fastest instructions. Optimizing compilers are required to take advantage of RISC machines and are one of the principal building blocks in RISC design.

**RISC.** Reduced instruction set computing. A computer technology that concentrates on making the most frequently used program instructions the fastest to execute. RISC chips eliminate microcode and nanoprocessors and require a tighter bond between the chip and the compilers used to build the programs that run on it. Examples of RISC computers include IBM's RT system and Hewlett-Packard's Spectrum line. RISC microprocessors include MIPS Computer Systems' R3000. Intel's 80486 chip will make use of some RISC techniques.

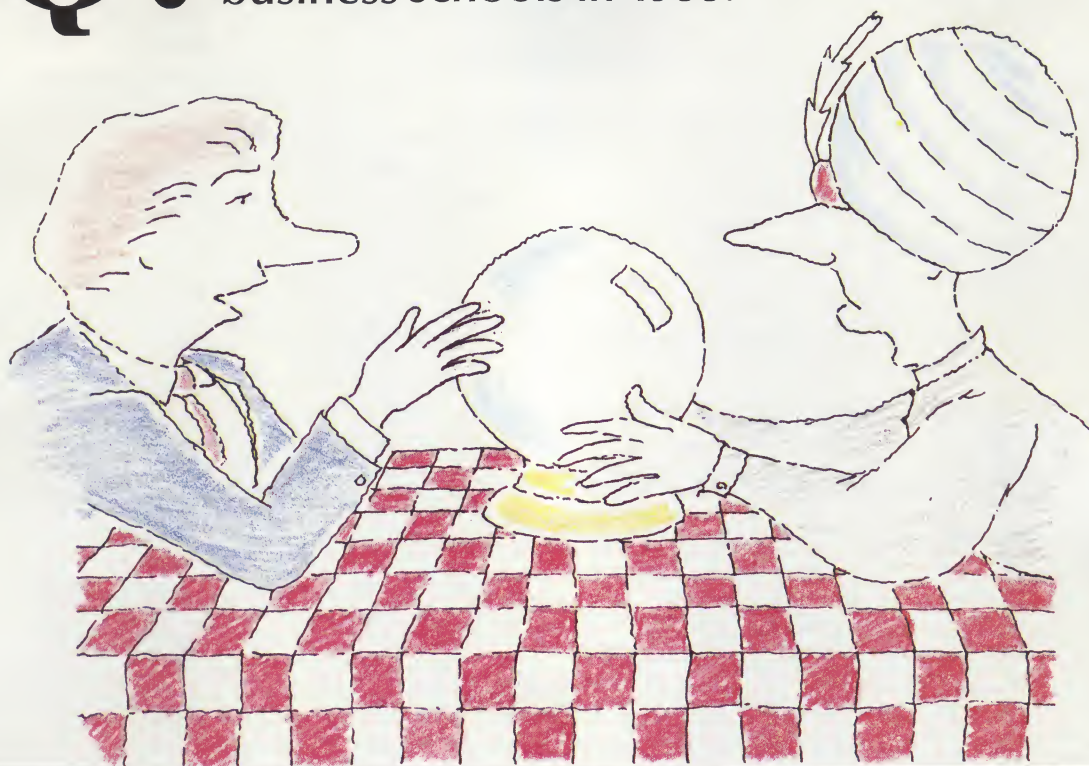
Nevertheless, the microcode-and-nanoprocessor approach has been easy to justify. New manufacturing techniques have allowed engineers to put more circuits on ever-smaller slices of silicon—all at lower costs than ever before. Since the first microprocessor—Intel's 4004—was introduced in 1971, the philosophy of "more circuits for more power" has been the accepted dogma of circuit design for computers large and small.

"When I was an engineer at IBM and I'd talk to people at Amdahl or Hewlett-Packard, we would all boast about who was making the most elaborate design. That was the vogue," says Jonathan Fram, now a technology analyst for Bear, Stearns & Company in New York. "Silicon was always getting cheaper, so we concentrated on putting more functionality into the hardware."

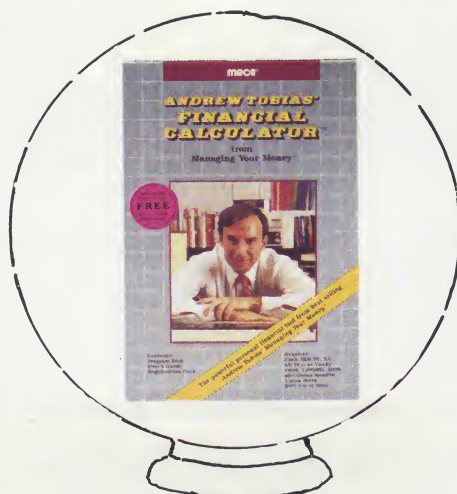
RISC heads in the opposite direction. Instead of putting functions into hardware, it emphasizes efficient software. RISC machines are usually programmed using high-level languages—such as FORTRAN, COBOL, and C—and optimizing compilers.



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Instead of merely translating instructions into the machine language used by the RISC machine, such compilers ensure that the resulting code makes optimum use of the computer's hardware.

### Initial RISC

While all this sounds cutting-edge, the principles underlying RISC date back to the first days of computing. In 1936, a decade before the first digital computers were made, Alan Turing proved that even the simplest computer—the Turing machine—could solve any problem solvable by machine.

"Turing showed that his machine could compute all computable functions. That means that all computers are essentially equivalent. The only arguments

were how the machine can work and how costly it would be to build," says Martin Hopkins, a research staff member at the Thomas J. Watson Research Center in Yorktown Heights, New York. Hopkins was on the design team that created the first RISC computer, IBM's 801, which was initially conceived to power fast telephone switching systems but never became a commercial product.

One of the implications of Turing's work is that the complexity of a computer's instruction set has no bearing on the power of the computer or on the kinds of problems it can solve.

"It doesn't matter whether a machine has the instruction or does not, as long as it has the bare minimum of instructions," says Hopkins.

## The New RT: Will IBM Get It Right?

The IBM RT Personal Computer, announced in January 1986, was one of the first commercially available RISC-based computers. It was also a dog. A combination of poor planning and poor marketing yielded an anemic, overpriced computer with a weak sales force behind it and a dearth of software products to run on it. To no one's surprise, sales slumped and the product all but vanished.

But within the past six months, sales have picked up and the prognosis has changed. In July 1988, IBM announced new RT products, stepped up training of its sales force, and began taking pains to woo software developers. A new RISC machine that will run at 10 million instructions per second (mips) and make use of an 80386 microprocessor and the PS/2's Micro Channel is expected. Indeed, some analysts believe that the RISC-powered RT may finally have its day.

All this is a far cry from the early days of the RT. When IBM first released the machine, the company paid more attention to marketing than it did to technology. Instead of producing the best product money could buy, Big Blue introduced a computer geared to its existing product line, says Stewart Alsop, editor of *P.C. Letter*. The RT was priced high so it wouldn't cut into

PC sales and was underpowered so as not to cut into minicomputer sales. But IBM was moving against the current. Workstation products from other market leaders were moving up in performance and down in price.

With a price tag of up to \$19,510, the RT delivered about 2 mips. Competitors such as Sun Microsystems and Apollo Computers offered similarly powered systems for much lower prices. For instance, the Sun-3/140 delivered 2 mips of power and cost \$14,900.

### Image Problems

The RT suffered from other problems as well. IBM had experience selling data processing products but knew little about technical and engineering markets. Engineers tend to be loners with an anti-data processing mentality, says Gartner Group analyst Bill Kirwin. But IBM chose to sell the RT through data processing channels, then compounded the machine's image problems by naming it the RT Personal Computer at a time when engineers felt that real



Up from the ashes: pronounced dead by analysts, IBM's RT may yet have its day.

men used workstations, not PCs.

Then there were software problems. A new computer requires software vendors to translate existing applications into code that the new machines can understand. But RISC was a radically new architecture, and because the chip contained fewer instructions, it required more work from the compiler, the program that performs the translation.

IBM's RT compilers had major problems, and software vendors who chose to port existing applications to the RT wasted time and money trying to write around the inadequacies. Other software vendors figured the installed base of RTs would al-



Throughout most of the history of computing, determining exactly what instructions should constitute an instruction set was more an art than a science.

"With the first commercial IBM computers, the 701 and 702, people built the machines more or less on the basis of their intuition," Hopkins explains. "The 701 was given instructions that were thought to serve scientific users; the 702 got instructions thought better for commercial users."

When IBM tried to unite its proliferating application-specific computers into a single, more general-purpose line such as the 360, these instruction sets were combined so that one machine could satisfy all needs. The result was, of course, a wide, varied, and complex set of instructions.

ways be small. Moreover, Sun and Apollo, two leaders in the workstation market at the time, both used Motorola chips, so software applications needed minimal tweaking to run on either system. Vendors had a larger installed base to write for and less aggravation.

But the workstation market, estimated by Dataquest at \$3 billion and expected to double by 1991, is too large to ignore, and IBM cannot afford to turn tail and walk away. "[This] is a strategic product area, and we are devoting as much money to developing our RISC-based hardware as we are to our PS/2 hardware," according to IBM spokesman Doug DeLay. And IBM is having some success: technical advances and changes in marketing have produced an upswing in sales, and IBM claims that June was the best month ever for the RT.

### IBM Power Play

To make its products even more attractive to engineers, IBM has improved performance and is confident that it can double it every 12 to 18 months. In fact, the RT ranked second in price/performance, ahead of several Sun and Apollo products, according to *UNIX Revue* magazine. Silicon Graphics of Mountain View, California, recently agreed to sell graphics cards to IBM that would allow a workstation to create and manipulate three-dimensional models. It is not clear at this time wheth-

er the cards will be used in the RT, but they would be a plus.

IBM also dropped the PC suffix from the product's name; it is now known as the RT system. DeLay adds that IBM has strengthened its technical sales force that serves the workstation market.

To attract third-party software support, IBM invited about 250 vendors to a meeting in July. "[The purpose] was to emphasize our commitment to AIX [the RT operating system] and to urge them to use it," says DeLay. Since the RT's release, efforts have been made to beef up the compilers. Silvar-Lisco of Menlo Park, California, a manufacturer of engineering software, worked with the original compilers and says that the current versions are better than the originals.

Big Blue may never dominate the workstation market as it dominates the PC market. But at least one analyst believes that IBM will pour a significant amount of resources into the RT because a superior product is critical to the company's success. "I think IBM's future as the dominant computer company hangs on its ability to produce a successful workstation," says Charles Fouldyler, president of Daratech, a market research firm. "Eventually, they'll get it right." —Randy Ross

*Randy Ross is an associate editor of PC/Computing. Although he likes dogs, he hesitates to buy an IBM RT.*

This same one-size-fits-all philosophy was carried through in the development of other computers and microprocessors. The falling cost of hardware added the impetus to integrate more instructions into the computer's repertoire and resulted in today's dominance of CISC designs.

The inspiration that broke the CISC monopoly came serendipitously. "In order to study memory caching around 1968, instruments were attached to computers to produce long instruction traces. One of the by-products of these studies was that we learned which instructions were being used," Hopkins explains. "The results came as an absolute shock to the people at the time. On a machine with approximately 200 instructions, about 10 of them consumed about two-thirds of the execution."

Moreover, the program traces showed that most of the computing was done by basic instructions, not by the more powerful, complex, and specialized ones. Further research at the University of California at Berkeley and Stanford University demonstrated that there were even instances where a sequence of simple instructions could perform a complex task faster than a single complex instruction could.

The result of this research is often summarized in the 80/20 rule: about 20 percent of a computer's instructions do about 80 percent of the work. That discovery led to the intriguing idea of optimizing the computer's performance for that 20 percent of the instructions, speeding up their execution as much as possible. The remaining 80 percent of the commands could be duplicated, when necessary, by combinations of the quick 20 percent. Analysis revealed that the 20 percent could be made so much faster that the processing overhead required to emulate the 80 percent was no handicap at all. System performance could be dramatically improved.

From these concepts, John Cocke at IBM's Yorktown research center invented RISC in 1976. In 1987 his work on RISC won him the A. M. Turing Award, given by the Association for Computing Machinery as its  
(continued on page 186)



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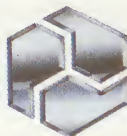
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## The Business of RISC

▶ RISC may mean speed for users, but for manufacturers it means the potential for big profits. According to a San Francisco consulting firm, The Information Network, RISC microprocessors will grow from 6 percent, or \$17 million, of 32-bit microprocessor sales in 1987 to nearly 39 percent, or \$505 million, by 1992.

Two types of companies are locked in a war to dominate this market: computer manufacturers and chip makers.

One of the first computer makers to focus solely on RISC technology is MIPS Computer Systems, founded by a group that included John Hennessey, a Stanford professor famous for RISC research. MIPS sells two RISC processors: the R2000 and the more recent (and faster) R3000. It has licensed rights to manufacture the chip to three semiconductor companies, all in California: LSI Logic of Milpitas, Performance Semiconductor of Sunnyvale, and Integrated Device Technology of Santa Clara.

The company pulled off a coup in September when the Digital Equipment Corporation decided to use MIPS chips in future workstations and possibly in minicomputers. About 60 minicomputer and workstation makers, including Silicon Graphics, have chosen the MIPS chip.

### The Rising Sun

Challenging MIPS is Sun Microsystems, a leading workstation manufacturer. The company developed its own RISC-based microprocessor, called the SPARC, for high-end Sun-4 machines to fend off stiff competition in the workstation market. In the second quarter of 1988, the Sun-4 accounted for 25 percent of Sun's systems revenue.

Sun has licensed its chip design to other companies, most notably Fujitsu Microelectronics. By li-

censing the SPARC design so that others, including potential competitors, could make the chips, Sun was trying to both create and adhere to a standard. The company also cozied up to AT&T, a Sun investor and home of the Unix operating system, to cook up a version of Unix that can be optimized for the SPARC architecture. Many other workstation companies interested in Unix, including Apollo, IBM, Digital, and Hewlett-Packard, felt threatened by this arrangement and congregated to form the Open Systems Foundation (OSF) to develop a version of Unix not as tied to Sun, AT&T, and Sun's SPARC.

Other computer makers that have developed RISC chips—including IBM and Hewlett-Packard—don't sell them to other companies, preferring to keep them as proprietary technology.

### Chipping Away

Semiconductor and chip companies didn't want to leave the RISC market to the computer firms, so they introduced RISC chips as the once-controversial design technique became respectable.

Some of these chips, such as Intergraph's Clipper chip, were aimed at general-purpose computing. Others were targeted at market niches. Weitek, best known for its math coprocessors, developed RISC processors for laser printers. Acorn Computers, a British microcomputer firm, announced an Acorn RISC Machine (ARM) chip. Inmos, another British firm, sells its Transputer chip for parallel processing work. And Intel came out with a line of RISC-like chips to be used as controllers for electronic equipment.

The two big chip makers in RISC today are Advanced Micro Devices and Motorola. AMD has been a hot competitor with Intel in the 80286 chip market but has been left out of the 80386 market

because Intel will not license that chip's design. But AMD has a RISC answer: its 29000 chip. This new design uses RISC principles to run at speeds far greater than the 286 or 386 can even attempt. The 29000 can be used today as a coprocessor in a Macintosh II using the McCray 29000 board from YARC Systems of Westlake Village, California.

Motorola moved boldly into the RISC arena with its 88000 family, introduced in April. The 88000 chip set—which consists of an 88100 CPU and two 88200 chips for caching and memory management—is the most highly integrated RISC processor available. In other words, it allows a complete system to be built with the fewest chips.

Motorola's 88000 family is newer than AMD's 29000 and appears to be in the same league as Sun's SPARC. The introduction of the 88000 was a welcome event to computer companies that were wary of depending on Sun for the cornerstone chip of their new systems. Instead of licensing a chip design and an operating system from a competitor, they now can turn to an established chip manufacturer.

Tektronix of Beaverton, Oregon, was one of the first companies to bring RISC to personal computers by using the 88000 chip set. The company offers an 88000 development board that can be plugged into a Mac II; it can increase the Mac II's speed by 10 to 30 times, according to its maker, and application programs written for it can run under the standard Macintosh operating system.

—Michael Slater  
and Phillip Robinson

*Michael Slater is editor and publisher of the Microprocessor Report. Phillip Robinson, editor of Desktop Engineering News, helps demystify topics like RISC in his articles on science and technology.*



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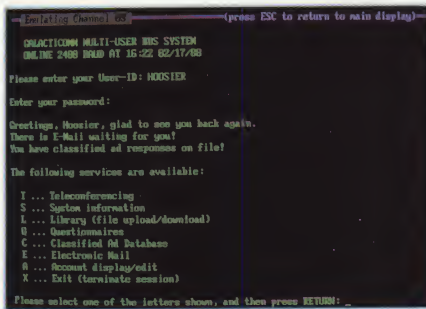
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```

Total System Information and Statistics as of 2130 02/21/80
Module Name      Hours      %CPU      Age Group  0-10  10-20  20-30  30-40  40-50  50-60  Total
-----
Main Menu        150  10.7  Normal    100    82    43    12    37    251
Teleconferencing 12309  42.9  IBM PC    230    563    661    239    125    1818
Mac              23    0.3  Mac       13     18    4     4     1     38
Apple            23    0.3  Apple     20     30    29    0     1     80
Commodore         40    1.7  Commodore 36    17    4     3     1     59
System Information 2061  20.4  Atari     113    22    12    7     6     160
Library (file ops) 14622  57.4  TKS-80    50    43    21    14    7    135
Queue Lengths    302    3.9  CP/M      12     19    6     6     6     50
Total            674    43.0  Total     674    803    840    340    200    2656

Classified Ad Data
Electronic Mail   0440  16.0  IBM       188    183    1174  2242    221    1547
Account Display/Ed
-----
Totals:
Downline: 3952      Upchain: 550
Calls: 7061         Live Calls: 30722
EMail: 11730        DMail Open: 514
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(continued from page 179)

highest honor for technical contributions to computing.

The first commercial product developed as a direct result of Cocke's original work at IBM's Watson lab, the IBM RT PC (RT stands for RISC technology), was introduced in 1985. Although it got off to a slow start, from which it has yet to recover, the RT's difficulties were not due to the underlying RISC design but rather to competitive pressures. The workstation market for which it was designed was crowded with competitors with lower prices and better performance.

The ROMP (Research/Office Products Division Microprocessor)—the RISC chip at the heart of the RT—is also being used by IBM in an experimental computer called the RP3. A similar processor is used for some support functions inside the 3090 mainframe.

### Slow Start

After several papers on RISC were published in the early 1980s, it became a hot topic in computer science classes, but it had difficulty breaking out of the laboratory. Although its power was proven, no software was available to take advantage of its capabilities. Creating efficient programs for RISC computers requires special language

compilers designed to optimize the use of the computer's fastest instructions. These compilers have only recently become available for RISC machines.

"The RISC concept was held back by compiler technology for at least three or four years," says Bob Miller, chairman and chief executive officer of MIPS Computer Systems. "People mastered the silicon long before they had effective compilers to create the software. Today, compilers have finally caught up with the hardware."

The lack of software held up the release of Hewlett-Packard's current RISC-based line of minicomputers, code-named the Spectrum series during development. Converting programs to run on these RISC machines pushed back availability for nearly a year and generated financial hardship for the company. No one wanted to buy the old HP computers

## Evaluating the RISCs

COMPANY	CHIP	MIPS	INSTRUCTIONS	TRANSISTORS
Intel	8088	0.3-0.5	133	50,000
	8086	0.5-1.5	133	50,000
	80286	2.0-4.0	153	180,000
	80386	4.0-7.0	144	275,000
	<b>80486<sup>1,2</sup></b>	<b>15</b>	<b>144-160</b>	<b>1,000,000</b>
Motorola	68000	0.7-1.3	91	68,000
	68010	0.8-1.2	95	84,000
	68020	2.0-5.5	101	195,000
	68030	3.0-8.0	106	300,000
	<b>88100</b>	<b>14-17</b>	<b>51</b>	<b>165,000</b>
Advanced Micro Devices	29000	17	116	205,000
MIPS Computer Systems	R2000	8-12	78	100,000
	R3000	16-20	78	100,000
IBM	RT PC	1.6-2.1	118	42,000
	RT System	5.6	118	62,000
National Semiconductor	NS32C032 <sup>2</sup>	0.75	116	65,000
	NS32332 <sup>2</sup>	2.5	116	90,000
	NS32532 <sup>2</sup>	10.0	117	370,000

### SPARC Chips

Cypress	CY7C601	20	78	72,000
Fujitsu	MB86900	10	110	56,000
	S-25	15	110	56,000

### LSI Logic:

Cypress compatible	L64811	20	70-80	100,000
Fujitsu compatible	L64801	12-15	70-80	100,000

<sup>1</sup> Estimates provided by Michael Slater, editor and publisher of the *Microprocessor Report*.  
<sup>2</sup> RISC/CISC hybrid.

All measurements are in VAX MIPS except for IBM products, which use a similar proprietary measure of power.

**RISC chips use simpler, and often fewer, instructions to generate more horsepower than non-RISC processors. Here, RISC chips are in bold.**

when the new technology was on the way.

"Porting software over took longer than we anticipated," admitted Jerry Huck, section manager for the architecture lab at Hewlett-Packard.

The problem was not with RISC itself, however. Any new processor design requires new software, and RISC did not overly complicate the software translation.

"Even if the new systems were not based on RISC, we would have had the same difficulties. There's nothing about RISC that made it harder to produce the system. In some cases, RISC made it easier," according to Huck.

None of the available RISC computers runs DOS or OS/2, nor is any RISC machine likely to. RISC processors use smaller and more specialized instruction sets, so they cannot run the same programs as



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CISC processors. DOS might be executed on RISC machines using emulators—programs that mimic the CISC processors DOS runs on—but this technique requires substantial processing overhead. With this approach, even the fastest RISC processors would run slower than CISC machines.

OS/2 poses similar problems. "Because OS/2 is written in assembly language and RISC works with higher-level languages, OS/2 doesn't lend itself to RISC either," notes Miller.

#### Future RISCs

The next generation of operating systems probably won't suffer such constraints. Unix is already the preferred operating system for most RISC machines.

The need for new operating systems and the relative simplicity of the circuitry mean that RISC will be the design philosophy of the future. Because RISC machines involve fewer circuit elements, RISC techniques hold the key to surmounting one of the biggest barriers to computer performance—the speed of light.

All of today's computers are built from thousands of circuit elements that are basically miniature transistors etched into the silicon of the integrated circuit. The electrical thoughts of the computer have to pass through those transistors to make the machine

work. The farther those signals go, the longer it takes to execute an instruction. A computer can change states—that is, carry out a logical operation—only as quickly as electricity moves through its circuits.

"Man has been able to do nothing about the speed of light since Einstein. It's one of the things we have to learn to live with," says Fram.

Since a longer-traveling signal means a slower computer, size is one of the primary factors limiting computer speed. While the latest emitted-coupled logic (ECL) circuits switch faster than conventional transistor-transistor logic (TTL) designs, and semiconductors made with such exotic materials as gallium arsenide can increase the speed at which circuit elements switch, the overall performance of the computer is still limited by the number of circuit elements and the distance separating them.

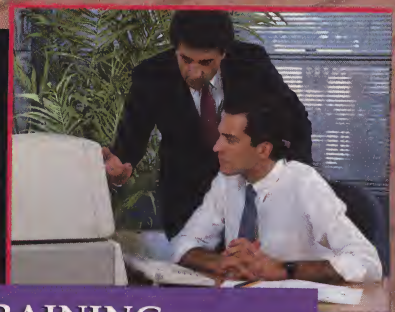
"When you go from TTL to ECL to gallium arsenide, it improves switching speed but does nothing about how long it takes signals to get between transistors," says Fram of Bear, Stearns. "Even if a transistor could switch infinitely fast, you couldn't have infinitely fast computers because the signals still have to travel."

That's one reason why today's supercomputers are not the huge, room-filling monsters that 1950s science fiction predicted they would be, but rather com-

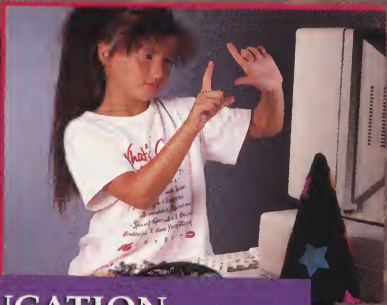
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Because RISC machines are inherently simpler and involve fewer circuits that can be packed closer together, they are faster. For example, Miller assumes that CISC processors similar to Intel's 80386 will be able to carry out up to 10 million instructions per second in the next three years, while he predicts an ECL RISC processor will reach 250 to 300 mips during the same period.

Making things simpler offers other advantages. For one, RISC machines and microprocessors are easier to design and build.

Because they can be smaller than conventional microprocessors, RISC chips help overcome one of the plagues of manufacturing—yield. When integrated circuits such as microprocessors are made, dozens can be produced on a single matrix, a slice of silicon 3 to 5 inches in diameter. After the circuits are grown and etched into the crystal, they are cut into individual pieces, tested, packaged, and sold.

During the fabrication process, errors are unavoidable. A speck of dust or a bit of semiconductor that doesn't grow or etch properly can prevent the finished circuit from working. The larger and more complex the circuits on the matrix, the more likely

**RISC is all about speed and power—one expert predicts that in three years a single processor will deliver 25 to 30 times the punch of an 80386 chip.**

any one (or all of them) will be plagued by a defect. Consequently, the yield of usable circuits from a matrix plummets as the circuits become larger and more complex. Because RISC chips are simpler, the yield can be greater.

Even if all microprocessors don't move into the RISC arena, the advantages of RISC design are permeating the industry. Even the makers of leading CISC chips are incorporating RISC elements into their products.

"We've made it clear that the 80486 will use some RISC design techniques," says Kevin Teixeira, Intel spokesman on RISC and Unix issues. "We will pick and choose and use whatever is appropriate."

So, if you want top performance, you may be in line for a new RISC engine. And even if you don't venture out of the DOS world, you're still likely to encounter a little bit of RISC in your next computer. ■

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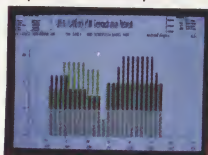
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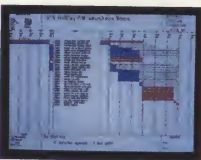
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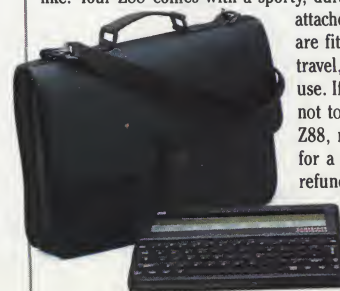
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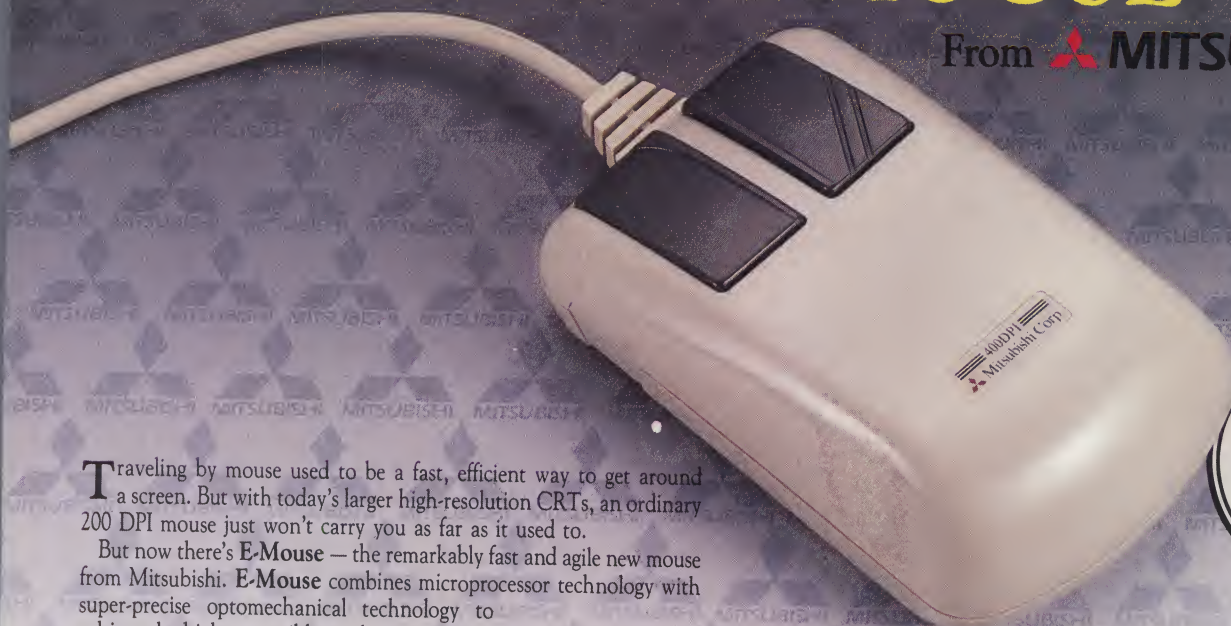
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# Happy High-Tech Holidays

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Eleven modems mailing,

Ten faxes faxing,

Nine printers printing,

Eight chairs for sitting,

Seven mice a-mousing,

Six games for playing,

Five flop-py disks,

Four cordless phones,

Three desk lamps,

Two keyboard stands,

And a laptop in a gift box.

Light the fire and warm the wassail. Load *Miracle on 34th Street* in the VCR. You've got a few more shopping days before the holidays, but a little seasonal cheer can be just the tonic you need to brave the stores and find just the right gifts for the PC users on your list.

We've noticed that as Christmas and Hanukkah approach, many people are all aglow, as if they were hearing a sweet carol or a spritely seasonal tune, but others look as if they just wish it would all go away. Now, we know that the holidays and much of what attends them have become an excuse to entice consumers to buy, buy, buy. We know too that Santa—let alone Rudolph—doesn't exist, and, sadly, that the North Pole harbors no elves. Nevertheless, *PC/Computing* wants all your days to be *merry and bright*.

So for those of you who aspire to experience the true spirit of giving, we'd like to help you make sure—before you trim the tree and hang the stockings by the chimney with care—that the presents you buy for family and friends express your appreciation and love. So we sent away for catalogs and went shopping, too, in places that ranged from the Museum of Modern Art and Bloomingdale's to The Sharper Image and Charrette.

If your gift list bears the names of PC users—and whose doesn't these days?—take a look at what we've collected. In the spirit of the holidays, we present the right high-tech stuff for the high-techies in your life.

Now, can't you just smell those chestnuts roasting on an open fire?

—Carol Olsen Day



● If your pockets are lined with cash and you want to overwhelm that special PC sybarite in your life, put the GRiDCase 1530 under the tree. At \$7,995, this 386 laptop is the ultimate gift for PC movers and shakers. It boasts a dazzling gas plasma display and supports CGA graphics. And it's the only battery-powered portable 386 that you can actually use on your lap. Why not get friends and family to chip in and make someone on your list feel like a computing James Bond? Contact GRiD Systems Corp., 47211 Lakeview Blvd., P.O. Box 5003, Fremont, Calif. 94537, 415-656-4700. (See "Take-Out Power: 386 Portables" in this issue for more about this paragon of high-tech good looks and efficiency.)



● Looking for a handy accessory for the road-weary laptop users in your life? Traveling Software's Battery Watch keeps track of the power left in a laptop's batteries. At only \$39.95, it's a sugarplum-filled dream of a stocking stuffer for those who compute on the road. Traveling Software, 800-343-8080.




● If you find the GRiDCase too steep for your holiday budget, the Scully Computer Brief, a \$350 luxurious leather laptop case, will set the most finicky laptop-toting trendsetter on your list all aglow on December 25 and throughout the year. Scully, 213-749-3066.

For someone who'd rather pump iron than sling a 386 portable over his shoulder, this luggage cart from the Museum of Modern Art is just the thing. Made in West Germany, it weighs a little over 2 pounds but can tote 66. Perfect for overloaded travelers who prefer not to keep a chiropractor on retainer in every port of call, the cart sells for \$90 (\$81 for MoMA members). To order, call the Museum of Modern Art, 800-447-6662.







● Slip Quadram's JT Fax Portable into the stocking of the small-is-better proponent on your list. Only 3½ by 6 by 1 inch, it's IBM compatible and costs \$495. Quadram Corp., 404-564-5566.



● For executives with everything but a clue to where they're headed next, pick up the Psion Organiser II. This \$249.95 handheld PC has 32KB—enough to keep the most hectic schedules on track. Psion, 203-274-7521.



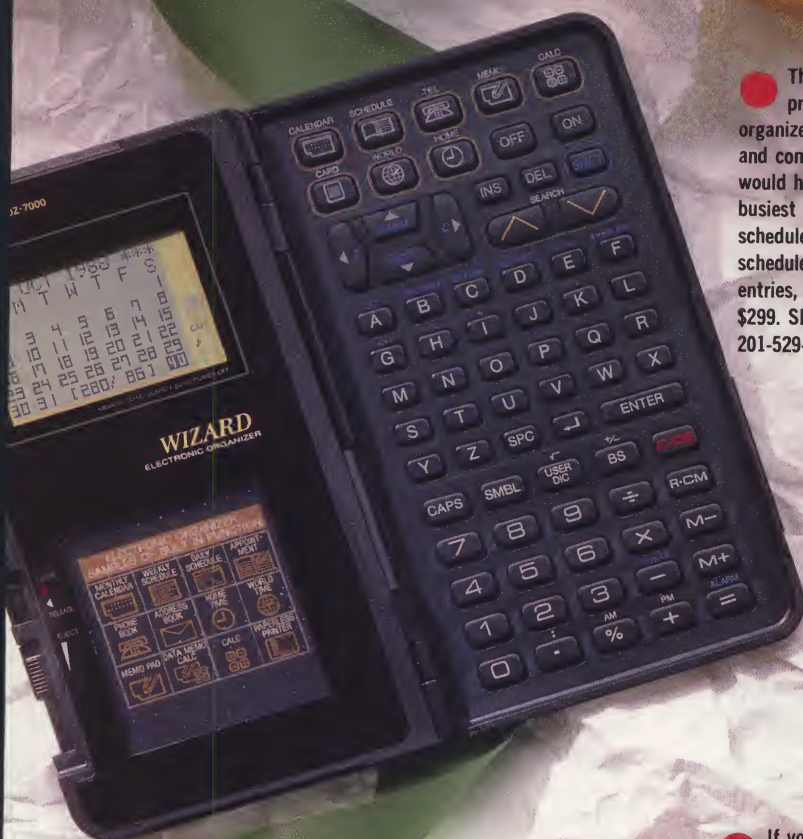
● Just as you can never be too rich or too thin, you can never be too organized. That's why we've put together a sleigh-load of disk organizers. The Disk Valet holds six 3½-inch diskettes and costs \$7.50, from RamStar Group, Inc., 800-327-2303. For travelers, the Leather Diskette Wallet protects ten 3½-inch diskettes and comes in four colors, for \$24.95, from Remember When, Inc., 508-685-4504.



● The Migent Pocket Modem is what many an on-the-run micro maniac would love to get from Santa. It weighs less than 9 ounces and is small enough to fit in your pocket. Plus its memory is nonvolatile. Très cool at \$159. Migent, Inc., 702-832-3700.

# Deck the halls with boughs of holly...





● The Wizard, a password-protected electronic organizer with 32KB of RAM and communications ports, would help keep even the busiest elf in Santa's crew on schedule. It features a calendar, scheduler, calculator, phone entries, and more, and sells for \$299. Sharp Electronics Corp., 201-529-8874.



● If you want your high-techie to phone home, give him or her this portable Panasonic cordless phone—at \$169.95, it's pocket-sized and loaded with features. Panasonic, 201-392-4767.

● Order some of these MoMA-approved diskette holders as stocking stuffers for your design-conscious office mates. The Helix Expandable Disk File carries ten 3½-inch diskettes and costs \$15. In another MoMA-sanctioned design, ten diskettes fan out for view. What could be better for trendy, well-organized types? The price? A mere \$13. Museum of Modern Art, 800-447-6662.







Looking for a practical yet thoughtful token for the typists on your list? The Curtis Document Clip is a handy \$6.95 item that saves desktop space and reduces eye fatigue. Curtis Manufacturing, 603-532-4123.

## 'Tis the season to be jolly...



For the mouseketeers in your life, pick up this handy mouse cleaning kit and mouse pocket. At \$24.95, it's just right for keeping a mouse out of trouble. Kensington Microware, Ltd., 212-475-5200.



This Sharp Fax Phone UX-50 is the right stuff for hard-copy mavens. It's \$1,399, but what a way to send your Christmas greetings, not to mention valentines. Sharp Electronics Corp., 201-529-8874.

Santa's workshop harbors some hard-working little mice, and so does Microsoft's. In fact, the Microsoft Mouse is a nifty stocking stuffer. Your \$150 buys the bus port with paintbrush model; \$200, the serial PS/2 port model. Microsoft, 206-882-8080.







● Help your friend or loved one manage a busy January full of appointments by giving the gift of memory—32KB of memory, that is. The Casio Digital Diary SF-4000 will help the special person on our list manage hundreds of phone numbers (plug yours in first) and a full month of meetings (schedule a few yourself). The \$109 device also works as a computerized memo pad (December 31: pick up champagne) and a calculator (Dom Perignon: \$125 a magnum, times 14 bottles, equals \$1,750). The Sharper Image, 800-344-4444.



● For those with a yen to keep their PCs flying as fast as Santa's sleigh, order these handy computer service kits. Maintenance is a breeze with the \$39 advanced kit or the \$89 troubleshooting kit. From CompuAdd, 800-627-1967.

● You've heard of Walkmans; now there's ScanMan: a handheld scanner that can scan black-and-white and most color images up to 4 inches wide by 11 inches long. It's \$299 and just the thing for the hardware trendsetter in your life. Logitech, Inc., 415-795-8500.







● Fans of comedian Richard Lewis and real and would-be denizens of the East Village will lose their cool over the sleek black Accel-500 dot matrix printer. As usual, cool has its price: in this case, \$1,285. Advanced Matrix Technologies, 805-499-8741.



● Put some color into the work lives of your friends and family. Put these SRW Microdex color-coded disk organizing systems under the tree. \$20 for 5¼-inch disks, \$18 for 3½-inch disks. Williams-Sonoma, 415-421-4242.



● Another MoMA find is the Eric Chan telephone. This stylish, ergonomically designed phone costs \$80 (\$72 for members of the museum). Museum of Modern Art, 800-447-6662.



● The horse knows the way to carry the sleigh, but laptop users must still carry their work over the river and through the woods. So give the one in your life a space-saving Flip Bag to hold disks. It folds flat to fit in a suitcase or briefcase. A model that holds five 5¼-inch disks costs \$19.75; for five 3½-inch disks, it's \$17.50. Elba, 404-373-3683.

# May your days be merry and bright...







● Couch potatoes who want to compute while they lounge will thank you for the Keyboard Pillow (\$19.95) when they stop laughing. It can nestle in your lap and prop your keyboard at the right angle. With an extra-long keyboard cord, you can even work in bed. TechCessories, 407-994-9060.



● Like you, the PC user on your list is probably knocked out by the hustle and bustle of the holidays. Why not give him—or yourself—the Scooter? You can bring this adjustable-height, tiltable keyboard stand (it will even hold a portable computer) to bedside or poolside for a more relaxed session. Available in nine color combinations, it costs \$241, from Herman Miller (who else?), 800-851-1196.

● A handy item from MoMA is the Fiskars Screwdriver, an ergonomically designed tool with five interchangeable bits stored in the handle. Only \$9.50, it's ideal for removing the case from a PC to put in a new board. Museum of Modern Art, 800-447-6662.



● Ah! At last, some *real* fun. Help your friends and family escape from the hustle and bustle of this busy season with a joystick and some games. The Epyx 500XJ Joystick works with both IBM and Apple machines and fits in the palm of your hand. \$39.95 from Epyx, 415-366-0606.

# Happy Christmas to all, and to all a good night.

*Edited by Carol Olsen Day,  
Marty Jerome, Jane Hallisey,  
and Peggy Wallace, all of  
PC/Computing. We can't  
wait to see what Santa  
brings us this year, and  
we're ready to toast the old  
and ring in the new.*







PC users who yearn for a clean machine will welcome your gift of the Mini Vacuum. It gets rid of unsightly keyboard dust; better yet, it's only \$9 and fits into a Christmas stocking with plenty of room to spare. CompuAdd, 800-627-1967.



Express your feelings! Let the special PC user in your life know you care, with the gift of a Hag Balans Chair. Designed to keep the sitter in a natural upright position to give his back a break, the chair sells for \$279. After trying it for a while, he'll be kneeling at your feet in gratitude. Charrette, 617-935-6010.



What could be more joyous to receive than a subscription to *PC/Computing*? If you subscribe now, you'll save 58 percent off the cover price and get the DIRectory Magic Programs Disk free with the paid subscription (\$14.97 now; basic annual subscription price is \$19.94). Fill out the postage-paid savings card in this issue or call 303-447-9330.

The Monday morning quarterback on your list will give you the high five when he finds NFL Challenge under the tree; \$99.95 from XOR Corp., 800-635-2425.

Keep Jack Frost from nipping at the nose of the baseball player in your family by giving him Earl Weaver Baseball to play indoors; \$39.95 from Electronic Arts, 415-571-7171.

Lest the game-players get

too rowdy and wake the sleeping babes awaiting the visit of Santa and his eight tiny reindeer, give them the Chessmaster 2000 on Christmas Eve. Advertised as "the most powerful computer chess program in the world," it's bound to keep the players

hushed as they contemplate their next moves. The game costs \$39.95 for the 5¼-inch-disk version and \$44.95 for the 3½-inch-disk version, from The Software Toolworks, 818-907-6789.

The gift of flight: Flight

Simulator lets your favorite PC user experience the thrill of flying without leaving the ground; \$49.95, from Microsoft, 206-882-8080.





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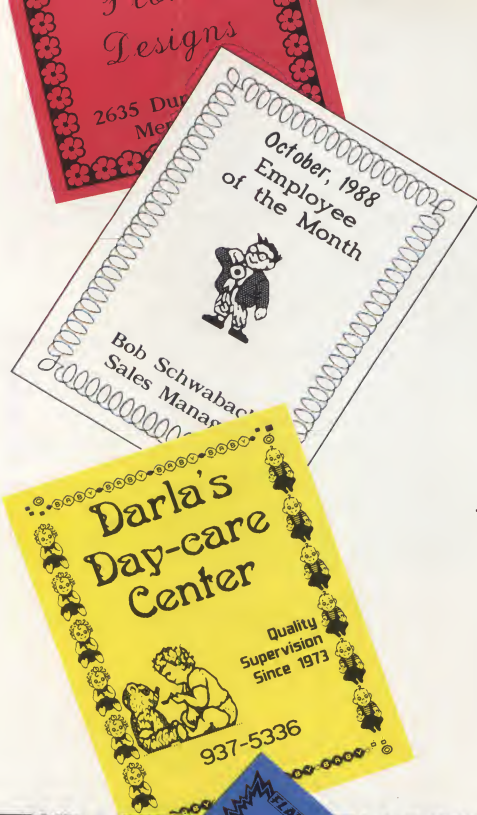
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# Speedy Starts

**Seven simple macros yield quick results from WordStar and PFS:Professional Write.**

**By EMILY BERK and  
CRAIG ELLISON**

**G**iven the choice between performing a repetitive task on a computer or letting the machine do the work, most of us would choose the latter. That's why we bought our machines in the first place—to let them shoulder the drudgery of performing repetitive tasks.

Yet many word processor users overlook one of the biggest time-saving features in many of today's word processing packages: macros. The word "macro" is short for "macroinstruction," which, loosely defined, means a command that executes a group of predefined commands.

If you've ever found yourself saying, "Gee, I wish I didn't have to type the same thing over and over again," then you have a perfect reason to learn to construct and use macros with your word processor.

There are two kinds of macro languages: simple and programmable. The simple macros generally record keystrokes as you type them, then play them back whenever you strike a particular combination of keys. Some packages also offer a pause feature, which will temporarily suspend the execution of the macro while you type a piece of information, such as a name, before resuming. Many simple macro languages will also let your macro call other macros for execution. The more complicated programmable macro languages, found in high-end packages such as Microsoft Word and WordPerfect, are actually miniature programming languages that allow you to include conditional commands.

Last month, we explained how to write seven time-saving macros for WordPerfect. This month, we show you how to write the same seven macros using two other top-selling programs: PFS:Professional Write Version 2.0 and WordStar Professional Release 4. Although our macros were written specifically to work with these releases, they present a basic command structure similar enough to earlier versions of the programs that you should have no trouble modifying them.

Using our macros with PFS:Professional Write and WordStar, you can:



1. Print the inside address of your letters out to envelopes. (You will have to position your cursor at the beginning of the address and put an envelope in your printer before invoking this macro.)
2. Change your margin settings.
3. Transpose letters in a word, so you can easily fix a typo like *teh*.
4. Indent a paragraph and then restore the document's original format settings.
5. Generate a standard closing for a letter.
6. Create a header at the top right of each page with the format "Page 3 of 12."
7. Create a boilerplate memo format.

WordStar and PFS:Professional Write both take the simple approach to macros, but the way you actually develop macros in each is quite different.

Writing macros for PFS:Professional Write is very easy. You merely open a menu, *select Define Macro*, and start recording the keystrokes the way you want them to be played back. As you record the keystrokes, you can see the results onscreen. For example, if you change margins while recording the mac-



ro, you'll see the margins change in your document. However, because PFS:Professional Write has no macro editor, if you make a mistake during the recording session, you'll have to scrap what you've done and start over. You finish recording the macro by calling up the menu once again, naming the macro, and giving it a brief description.

In WordStar, you begin a macro definition by pressing the Esc key. WordStar asks you what you want it to do by presenting a ? prompt. It asks you to select a character for the name of the macro (providing a list of existing macros) and to enter a description. You then type your macro. In WordStar, however, you can't see the macro execute as you type; you have to wait until you're finished, then play it back. The disadvantage to this is that you have to plan how to construct your macro; you may even have to write down the keystrokes before you type them in. However, if you do make a mistake, you can go back and edit the macro.

Both programs let you chain macros together, or let one macro call and execute another. In fact, you will often have to do this in WordStar because the program limits the length of individual macros to about 64 characters; more complicated tasks require that macros be chained.

One nice feature of PFS:Professional Write that WordStar does not share is the ability to "pause" the macro, which lets you type in material from the keyboard, then continue executing the macro. We used this feature in four of the PFS:Professional Write macros you'll find below.

### PFS:Professional Write

To create a macro in PFS:Professional Write, you enter <Alt-0> (that's the Alt key used with the zero key, not the capital O) to open the macro menu, type 2 to select Record a Macro, and hit Enter. Then type the macro as we've printed it here.

When you've finished recording the macro, strike <Alt-0> to open the macro menu and 2 to select End and Save Recorded Keystrokes. A window will pop onto the screen. It presents you with various key combinations from which you can choose a name to invoke the macro whenever you need it. Simply move the cursor to the name you want to use, then type a description of what the macro does. For instance, you might want to use <Alt-E> as the name to invoke a macro that automatically prints an envelope address from the inside address of a letter and then type "envelope macro" as a description.

When you're finished, strike Enter. This ends your macro session and records the macro.

*Emily Berk is a programmer and microcomputer consultant with Armadillo Associates of Jersey City, New Jersey. Craig Ellison is network administrator of the New York Metropolitan Opera Association.*

### Macro 1 Address an envelope.

Type	Why
Ctrl-T	Start block define.
Ctrl-Home	Define beginning of letter.
Del	Delete block (everything above address).
Alt-0	Open macro menu.
1 Enter	Select Pause Macro and begin keyboard input.
▼ ... ▼	Move cursor down to line below address.
F9	End keyboard input.
Ctrl-T	Start block define.
Ctrl-End	Define end of letter.
Del	Delete block (everything below address).
Ctrl-Home	Go to beginning of address.
Ctrl-T	Start block define.
Ctrl-End	Define full address.
F10	End block definition and open text block operations menu.
8	Select double spacing.
Ctrl-T	Start block define.
Ctrl-End	Define full address.
F10	End block definition and open text block operations menu.
6	Select Change Indentation.
▶ ... ▶	Move cursor right to define left margin of address on envelope.
Enter	End left indent definition and execute.
F4	Open format menu.





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## NEC



2		Select margins/page length.
12	Tab	Set top margin to 12, tab to next field.
0	Tab	Set bottom margin to 0, tab to next field.
24	Enter	Set page length to 4 inches.
	Ctrl O	Open printer menu.
	Enter	Print envelope.

To finish, open the macro menu, select End and Save, name the macro, and enter a description.

### Macro 2 Redefine margins.

This macro will change document margins to 15 characters on the left and 60 on the right.

Begin with the macro procedure, then:

Type	Why
Ctrl Home	Position cursor at beginning of document.
Ctrl T	Start block define.
Ctrl End	Define entire document.
F10	End block definition and open text block operations menu.
Ctrl [	Select Change Margins or Tabs.
▶ ... ▶	Move cursor to position 15.
[	Set left margin.
▶ ... ▶	Move cursor to position 60.
]	Set right margin.
Enter	Execute margin change.

To finish, open the macro menu, select End and Save, name the macro, and enter a description.

### Macro 3 Transpose two letters.

This macro makes use of PFS:Professional Write's cut-and-paste function. In order to place a letter in the paste buffer, you must first delete it using the

block delete function.

To begin, position the cursor on the first of the two letters to be swapped, open the macro menu, and begin the macro procedure. Then:

Type	Why
Ctrl T	Start block define.
Del	Delete block (one letter).
Del	Delete space.
▶	Move cursor right one space.
Ctrl P	Paste in letter from buffer.

To finish, open the macro menu, select End and Save, name the macro, and enter a description.

### Macro 4 Automatic paragraph indent.

This macro pauses to let you define paragraphs. It formats them after the text has been entered.

To begin, position the cursor on the first letter of the first paragraph to be indented, open the macro menu, and start the macro procedure. Then:

Type	Why
Ctrl T	Start block define.
Alt O	Open macro menu.
1 Enter	Select Pause Macro and begin keyboard input.
▼ ... ▼	Move cursor to last line of paragraph(s) to be formatted.
End	Go to end of last line.
F9	End keyboard input.
F10	End block definition and open text block operations menu.
Ctrl [	Select Change Margins or Tabs.
▶ ... ▶	Move cursor to position 15.
[	Set left margin.
▶ ... ▶	Move cursor to position 60.

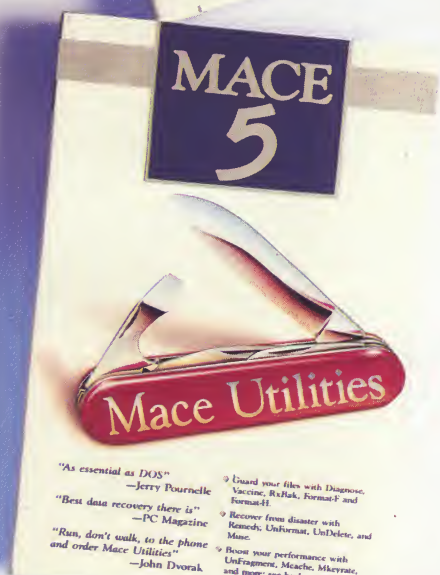


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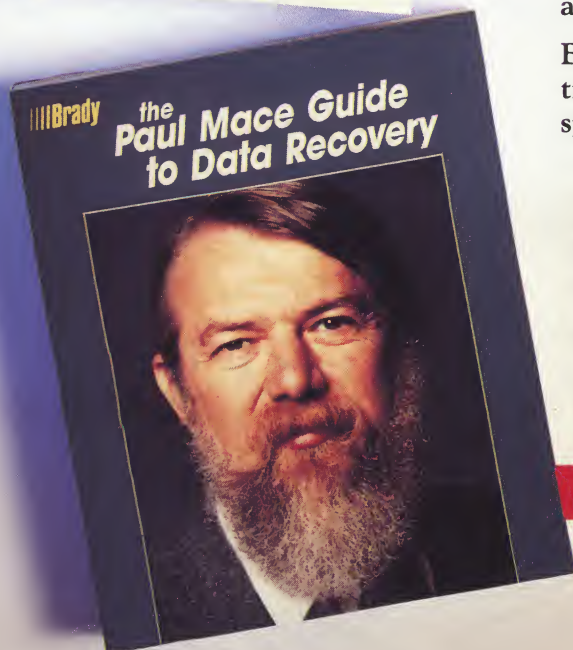
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CIRCLE NO. 142 ON READER SERVICE CARD.



1	Set right margin.
Enter	Execute margin change.

To finish, open the macro menu, select End and Save, name the macro, and enter a description.

### Macro 5 Boilerplate letter closing.

PFS:Professional Write must be in insert mode, not overtype, for this to work properly.

To begin, open the macro menu and start the macro procedure. Then:

Type	Why
Enter Enter	Leave two blank lines between letter and salutation.
Sincerely yours, Enter	Enter closing.
Enter Enter Enter Enter	Space down four lines.
John J. Jones, President Enter	Enter name and title.
Enter Enter	Space down two lines.
JJJ/pcc Enter	Enter initials.
Enc. Enter	Enter enclosure note.

To finish, open the macro menu, select End and Save, name the macro, and enter a description.

### Macro 6 Running head, "Page # of #."

PFS:Professional Write displays the current page number. You will need to jump to the end of the document, note the number of the last page, and type it into the header when the macro pauses for your input. In our macro, *N* represents the number of the last page; when you get to this point, use whatever number represents the final page number in that document.

Begin with the macro procedure, then:

Type	Why
Ctrl-End	Jump to end of document. Take note of page number.

F4	Open format menu.
3	Select Define Header.
Page *1* of	Enter text on Line 1.
Alt-0	Open macro menu.
1 Enter	Select Pause Macro and begin keyboard input.
N	Type number of last page.
F9	End keyboard input.
Tab Tab	Tab to position line.
R	R for right justify.
Enter	End header definition.
Ctrl-Home	Position cursor at beginning of document.

To finish, open the macro menu, select End and Save, name the macro, and enter a description.

### Macro 7 Boilerplate memo format.

This is similar to the letter closing, but if you are a frequent memo writer, it will save you a lot of time. This macro pauses to allow you to enter the name of the person you are directing the memo to, the date, and the subject. Your own name is part of the permanent boilerplate.

Begin with the macro procedure, then:

Type	Why
To: Alt-0	Enter addressee line and open macro menu.
1 Enter	Select Pause for Input.
F9	End keyboard input.
Enter	Space down one line.
From: Your Name Enter	Enter "From:" and your name.
Enter	Space down one line.
Date: Alt-0	Enter date line and open macro menu.



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CIRCLE NO. 196 ON READER SERVICE CARD.



1	Enter	Select Pause for Input.
	F9	End keyboard input.
	Enter	Space down one line.
Subject:	Alt 0	Enter "Subject:" and open macro menu.
1	Enter	Select Pause for Input.
	F9	End keyboard input.
	Enter	Space down one line.

To finish, open the macro menu, select End and Save, name the macro, and enter a description.

To execute your macros, hold down the Alt key and type the letter you used when you named the macro.

## WordStar

To create a macro in WordStar, press Esc, then ?. WordStar will ask "Character to be defined?" and give you a list of current macros. Press a single digit or letter that hasn't been used yet to create a new macro. When WordStar prompts, "Description for Esc menu," type in a description of your macro. WordStar will respond "Macro Definition," which is your signal to begin typing the macro.

Where you see the symbol ^ in our macros, you'll type the <Ctrl-P> key combination. Then you must continue holding the Ctrl key down as you type the following letter. Where you see the symbol [, you should press the Esc key. In these macros, the <Ctrl-P> key combination followed by the Del key is the sequence you press to insert a Delete into your macro. When you press that key combination, WordStar will produce a small triangle on your screen and in your macro.

Because WordStar limits the length of macros to about 64 characters, the long macros are broken into several short ones, with one invoking another. The characters ^[ followed by another letter or number indicate that one macro is invoking another.

The help level is set to 0 at the beginning of long macros to make them execute faster. If you don't wish to reset help, omit the ^[Z macro call.

Although WordStar won't automatically reformat your document after deletions, insertions, or margin changes, these macros reformat it for you. The com-

mands are printed on separate lines to explain how each functions, but you can type them as solid text.

## Macro 1 Address an envelope.

This macro assumes you use the greeting "Dear" immediately after the address. If you start your letters with a different greeting, change the word "Dear" in the macro. Since WordStar prints only from disk, the macro writes the address to a temporary file before printing, then automatically deletes the temporary file. Note that WordStar defaults to printing page numbers at the bottom of each page. To prevent this, insert .OP before printing. To create the macro you identify:

**Character to be defined:** 1

**Description for Esc menu:** Envelope.

**Macro Definition:**

Type	Why
^QR	Go to beginning of file.
^[Z	Call macro Z (defined below) to set help level to 0.
^[Y	Call macro Y (defined below), which embeds envelope format commands; mark beginning of address.
^QFDear^M^M	Search for word "Dear."
^KK^[8	Mark end of address block; write temp file; call macro 8 (defined below) to print envelope.
^[O	Call macro O (defined below) to delete temporary file.

**Character to be defined:** Z

**Description for Esc menu:** Set help level to 0 to speed up macros.

**Macro Definition:**

Type	Why
^[J^O^M	Set help to 0.

**Character to be defined:** Y

**Description for Esc menu:** Set up dot commands for printing envelope.

**Macro Definition:**

Type	Why
^KB^Q	Mark beginning of address; force insert mode.



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<b>^M.PF^M</b>	^M inserts a carriage return into the document; .PF forces reformatting of the address when the envelope is printed.
<b>.OP^M</b>	Omit page numbers.
<b>.LM 30^M</b>	Set left margin to 30 spaces.
<b>.MT 12^M</b>	Set top margin to 12 lines.
<b>.LS 2^M</b>	Set line spacing to double-spaced.

**Character to be defined:** 8

**Description for Esc menu:** Print envelope.

**Macro Definition:**

Type	Why
<b>^Kwtemp.env^M</b>	Write address to file Temp.env.
<b>^Kpntemp.env^M^[]</b>	Print Temp.env file.

**Character to be defined:** 0

**Description for Esc menu:** Delete Temp.env.

**Macro Definition:**

Type	Why
<b>^B</b>	Pause to allow printing to complete (reformats current paragraph).
<b>^KJtemp.env^M</b>	Delete file Temp.env.

## Macro 2 Redefine margins.

This macro changes margins on an entire document. It inserts dot commands, which are saved with your document, rather than control codes, which are not, and reformats the entire document after changes are made.

**Character to be defined:** 2

**Description for Esc menu:** Change right and left margin settings.

**Macro Definition:**

Type	Why
<b>^K0</b>	Set marker to return to this place in document.
<b>^Q^QR</b>	Force insert mode; go to beginning of document.
<b>.LM 15^M</b>	Set left margin to 15 spaces.

<b>.RM 65^M</b>	Set right margin to 65 spaces.
<b>^QU</b>	Reformat entire document.
<b>^Q0^K0</b>	Return to marked place; delete place marker.

## Macro 3 Transpose two letters.

This is a variation of a macro that comes with Release 4 of WordStar and transposes words. This macro makes words of single characters by inserting spaces, then deletes the added spaces when the transposition has been made.

**Character to be defined:** 3

**Description for Esc menu:** Transpose letters.

**Macro Definition:**

Type	Why
<b>^D</b>	Move right one character.
<b>^Q ^D ^S^S</b>	Force insert mode; insert one space; move one character right; insert another space; move two characters left.
<b>^T^H</b>	Delete second letter; backspace to delete added space.
<b>^S^U</b>	Move left over former first letter; place second letter before first.
<b>^D</b>	Move right one character; delete added space.

## Macro 4 Automatic paragraph indent.

This macro uses WordStar's built-in calculator, steals the previous left and right margin settings, and adds to and subtracts from them to build indented margins. When executing this macro, you type < Esc-5 > before typing the text you plan to indent or moving text that has already been typed into the pocket created by this macro. Then you will have to reformat your document.

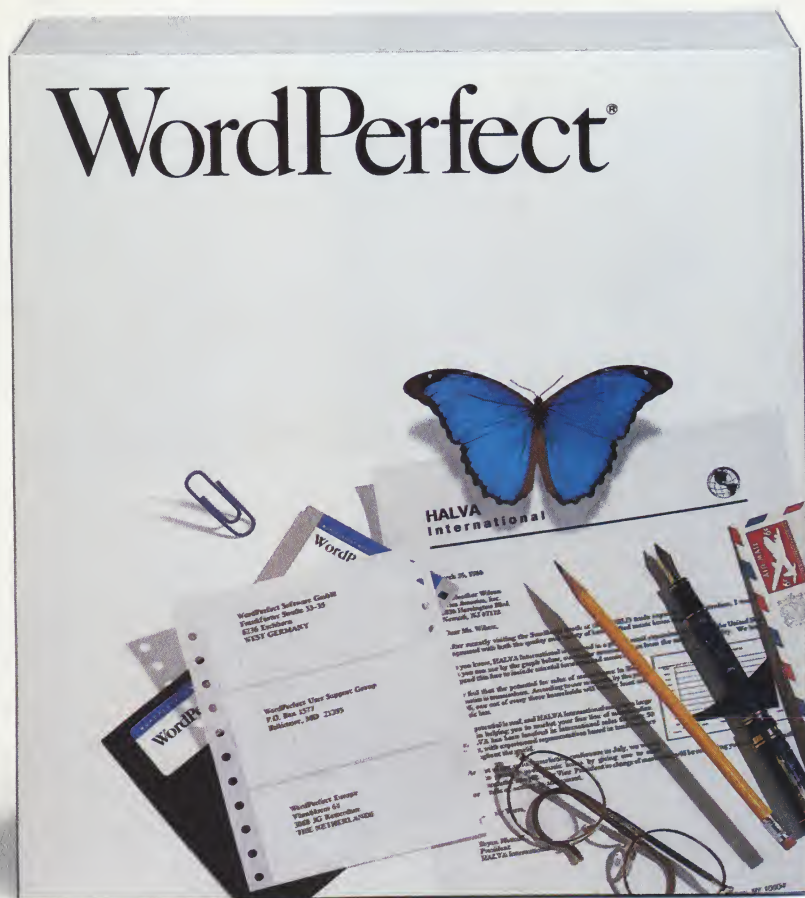
**Character to be defined:** 5

**Description for Esc menu:** Paragraph indent relative to existing margins.

**Macro Definition:**

Type	Why
<b>^[]Z</b>	Set help level to 0 to speed macro.
<b>^M^K0</b>	Insert a line; mark this place in document.





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CIRCLE NO. 174 ON READER SERVICE CARD.



<b>^[I</b>	Call macro I (defined below) to increment current left margin by eight spaces.
<b>^N^QD</b>	Insert a line; go to end of newly created .LM line.
<b>^Q1</b>	Go to second place marker.
<b>^[D</b>	Call macro D (defined below) to decrement current right margin by eight spaces.
<b>^Q1^K1</b>	Go to and delete second place marker.
<b>^Q0^K0^E</b>	Go to first place marker; delete it; move up one line.

#### Character to be defined: I

**Description for Esc menu:** Increment left margin by eight spaces.

#### Macro Definition:

Type	Why
<b>^Q0^[G</b>	Move to first marked place; find the previous .LM command.
<b>^Q0^U</b>	Copy it to the marked place.
<b>^F^QY^U</b>	Move to the spaces after the .LM command, delete and put them back.
<b>^E^U</b>	Copy the number of spaces in the left margin to the new left margin command.
<b>^KB^QD+8^KK</b>	Begin space block and add 8 to current margin; end block.
<b>^KM^[</b>	Calculate the new margin setting.
<b>^[=</b>	Insert new margin setting into current line.
<b>^KY</b>	Delete block in which math was done.
<b>^QS.LM ^QD^K1</b>	Go to beginning of line with new margin setting; insert .LM command; go to end of line; mark place for new right margin line.

#### Character to be defined: D

**Description for Esc menu:** Move right margin eight spaces to the left.

#### Macro Definition:

Type	Why
<b>^Q1^[H^Q1^X^X^U</b>	More or less the same as the sequence in macro I.
<b>^F^QY^U^E^U^KB</b>	
<b>^QD-8^N^KK^KM</b>	
<b>^[^=^KY^QS.RM</b>	

#### Character to be defined: G

**Description for Esc menu:** Get current left margin.

#### Macro Definition:

Type	Why
<b>^QF.LM^MB^M^Y^U</b>	Search backward for .LM; delete; undo.

#### Character to be defined: H

**Description for Esc menu:** Get current right margin.

#### Macro Definition:

Type	Why
<b>^QF.RM^MB^M^Y^U</b>	More or less for the same reasons you typed the command sequence for macro G.

### Macro 5 Boilerplate letter closing.

This is another adaptation of a macro that comes with WordStar Professional Release 4. It appends the closing to the end of your letter but returns you to where you were when you typed <Esc-S>. You edit a WordStar macro in the same way you create a new one. Call up the macro, press <Ctrl-R> to call up the description of the macro, edit it, and press Enter when you're done. Then press <Ctrl-R> to call up the definition, use the arrow keys to move through the existing macro, edit it, and press Enter when you're done.

#### Character to be defined: S

**Description for Esc menu:** Sincerely.

#### Macro Definition:

Type	Why
<b>^QC</b>	Go to end of document.
<b>Sincerely yours,</b>	Closing.
<b>^[n^[n</b>	Call another macro (defined below); insert four lines.
<b>Jill Jones, President</b>	Type name and title.
<b>^[n</b>	Insert two more lines.
<b>JJJ/pcc^MEnc.</b>	Insert words into document.
<b>Enter</b>	Completes the macro.

#### Character to be defined: n

**Description for Esc menu:** Insert two carriage returns.

#### Macro Definition:

Type	Why
<b>^M^M</b>	Insert two carriage returns.



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### Macro 6 Running head, "Page # of #."

Since WordStar doesn't automatically track the total number of pages in a document, this macro is designed to print "Page xx of ", where xx is the current page, and move the cursor to the line where the header is established, so you can insert the number of the last page of the document. Note that WordStar requires you to insert spaces to move the header to the right.

**Character to be defined:** 7

**Description for Esc menu:** Running header on top right.

**Macro Definition:**

Type	Why
^QR^Q	Go to beginning of document, force insert mode.
.H1	Insert header line.
(Insert spaces)	Move header to right.
Page # of ^N	Type header.

### Macro 7 Boilerplate memo format.

This macro inserts boilerplate at the beginning of your document even after you've created the body of your memo.

**Character to be defined:** M

**Description for Esc menu:** Memo boilerplate.

**Macro Definition:**

Type	Why
^QR^Q	Go to beginning of document, force insert mode.
TO:^[n	Insert memo items, double-spaced.
FROM: Your Name	Type your name.
^[nDATE:^[[@	Insert "DATE:" label and system date.
^[nSUBJECT:^[[n	Type Subject label.

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FOR:					
DATE	PAY TO THE ORDER OF	CHECK NO AMOUNT			
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# gone

## BUT NOT FORGOTTEN

**T**he names conjure up distant, foggy recollections: the Osborne, the Victor, the Eagle, the Columbia. Then there were IBM's PCjr and Texas Instruments' short-lived and incompatible TI 99/4A. Other flickering memories of computers whose time has gone include the Otrona and the Hyperion.

Yet, with the exception of the Osborne, all of these computers could be found on dealers' shelves as recently as 1984. Before their manufacturers eventually succumbed and discontinued them because of bad

**Resourceful owners of discontinued PCs can turn to user groups for support.**

**By  
DEBORAH  
ASBRAND**



management, poor marketing, or inferior design, some of the models had substantial sales. Texas Instruments shipped over 1 million TI 99/4As, and IBM delivered some 500,000 PCjrs before it gave up on the low-end market in 1985. And Eagle and Columbia sold 110,000 and 70,000 machines, respectively, before going out of business.

In the era of the 386 and OS/2, 1984-era PCs and CP/M machines are decidedly unglamorous. Yet more than a few plucky and sophisticated users have hung on to them. To make use of new software, they've expanded the memory, added hard disks, upgraded the BIOSs, replaced the keyboards, and plugged in color monitors.

PHOTOGRAPH BY HANS NIELEMAN







# Where to Turn

## GENERAL

### USER GROUPS

#### CompuServe Club

5000 Arlington Center Blvd.  
Columbus, Ohio 43220  
614-457-8600

*Offers bulletin board services for 13 orphan computers.*

#### Washington Area Eagle User Group

2022-L44 Baltimore Rd.  
Rockville, Md. 20851  
Contact: Chet Pryor  
301-340-0957

*Supports all orphaned computers. The \$15 annual membership includes a monthly newsletter, Winging It. A 24-hour bulletin board is open to all: 301-340-3207.*

### PUBLICATIONS

#### Computer Shopper

5211 S. Washington Ave., Box F  
Titusville, Fla. 32781  
407-269-3211

*Published monthly. Includes regular coverage of "classic" computers including machines from Commodore, Timex/Sinclair, Tandy, and Texas Instruments. Annual subscription \$29.97.*

## OSBORNE

### USER GROUPS

#### Boston Computer Society

One Center Plaza  
Boston, Mass. 02108  
617-367-8080

*Sponsors a SIG for users of CP/M machines. Annual membership \$35.*

#### FOG International Computer Users Group

P.O. Box 3474  
Daly City, Calif. 94015  
415-755-2000

*International nonprofit organization for CP/M and MS-DOS users. Approximately 140 affiliated user groups hold regular meetings. Annual membership \$30.*

#### San Francisco Computer Society

P.O. Box 783  
San Francisco, Calif. 94101  
Contact: Ralph Gallagher  
415-929-0252

*Supports CP/M and MS-DOS. Meets monthly. Annual membership \$10.*

### PARTS AND SERVICE

#### Wizard of OsZ

20630 Lassen St.  
Chatsworth, Calif. 91311  
818-709-6969

*Offers parts and service and conducts classes for the Osborne 1 and Executive. BBS 818-709-6978, open to all.*

#### Worswick Industries

4898 Ronson Ct., Suite H  
San Diego, Calif. 92111  
619-571-5400  
*Stocks hardware, software, and upgrades. Sells refurbished systems.*

## COLUMBIA

### USER GROUPS

#### Columbia Owners Group

c/o Godfathers Computers  
851 W. State Rd. 436, Suite 1015  
Altamonte Springs, Fla. 32714  
407-774-1111

*Stocks spare parts and provides service and upgrades for the Columbia MP 1600 and VP 1600. Provides technical support for members. Annual membership \$25.*

Cincinnati attorney Dave Yaros keeps his computers for the same reason other orphan owners do: he likes them. He bought an Eagle IIE-2 in 1983 to automate his law practice's billing and accounting procedures. The CP/M machine came with two single-sided drives, bundled software, and a one-year warranty. The next year, he bought Eagle's first hard-disk model. He has considered switching to DOS, but after running a few programs on a friend's PC, he remains satisfied with the gains that he's made using the two Eagles and a 40MB hard disk. "[The Eagles] have allowed me to double my output," says Yaros. "I don't know how going over to a PC system is going to change that whatsoever."

Often the reason for keeping the machines is that it makes financial sense. In addition to the hardware investment they've made, many users of older equipment have spent years assembling their software collections at considerable expense. Yaros, for example, has amassed a substantial number of CP/M programs. For him, switching to DOS would mean building a new system from scratch.

For Gary Anderson of Hayward, California, the price of DOS software makes giving up his TI 99/4A impractical. "TI users pay \$30 to \$40 for a word processing program. The best stuff for the TI is much, much cheaper than going to IBM," he says. For new programs, owners of discontinued computers turn to the shareware market.

Orphan computer devotees face special problems trying to obtain support for discontinued and

---

*Deborah Asbrand is an associate editor of PC/Computing.*

abandoned products. Manuals are hard to find, as are spare parts and service centers. Technical support telephone lines are among the first services scrapped by a down-and-out company.

Venerable computers may also suffer from afflictions of the aged. Some older models show patterns

## Users feel an emotional tie to their vintage computers.

of wear. The TI 99/4A has a connector that typically requires some pampering, and the keyboards and power supplies eventually give out. Over time, contacts begin to corrode and the motherboard reveals signs of age. On other models, the floppy drive heads may need replacing. But enthusiasts point out that all of these problems are easily remedied.

### Comfort in Numbers

Undaunted, resourceful owners form lifelines for their machines through membership in user groups. The recently christened Association of PC User Groups estimates that there are more than 5,000 user organizations supporting personal computers, many of them single-product or special-interest groups. They hold meetings, publish newsletters, and run bulletin boards. More important, they're often valuable sources of information on parts and service.

Gale Rhoades joined a user group almost immediately after she bought an Osborne 1 in 1981. She says that these organizations are "what barn raising and quilting bees had been to the pioneers"—a way to accomplish something useful and to share



experiences.

Rhoades is now executive director of FOG, the preeminent user organization that began as the First Osborne Group, expanded to encompass all CP/M machines, and in 1985 added support of DOS to its charter. FOG's Daly City, California, headquarters publishes magazines for both DOS and CP/M users and maintains software libraries for each operating system, as well as a database of over 2,000 user groups. There are 140 FOG affiliates throughout the world. In 1989, Rhoades expects FOG membership to reach 20,000.

FOG is the mother church of CP/M users. "We'll be supporting CP/M long after everyone else has forgotten what it is," Rhoades asserts. She and her staff dispense advice to users who contact the group by telephone, letter, and occasionally telegram. The group also reaches out to consumers through Commodore, which includes FOG fliers in the shipping boxes of its Commodore 64.

Fans of the TI 99/4A are legion, and they form a network of users that's as lively as FOG, if less structured. TI user groups number 300, with the Chicago group the largest at nearly 550 members. Other TI organizations are small but spirited. The 14-member north New Jersey group works with other New York-area computer groups to sponsor the TI Computer Fest, which each year draws about 300 people to attend workshops and hear speakers.

Healthy sales of secondhand computers direct a steady flow of new users into the groups. People purchase vintage equipment at garage sales, liquidation sales, or auctions, usually for a song. Orphan owners also donate their

equipment to church and civic groups. "A lot of these people are getting machines that have been in the closet for a few years," says Ralph Gallagher, president of the San Francisco Computer Society, which supports DOS and CP/M machines. "Sometimes they have no software or operating system. For these people, we're providing a service that no one else can."

Easy-to-use models such as the 99/4A and PCjr are frequently dusted off and refurbished for schoolchildren. In the Washington, D.C., area, The Metro PCjr User Group includes a dozen teenagers on its mailing list. Hunter Medney, a junior at Henderson High School in Atlanta, graduated from a TRS-80 to an IBM PCjr, only to find no support for it from the local PC user group. So he founded his own. He hosts monthly meetings in his family's living room.

### Keeping the Faith

The 99/4A and the PCjr were early experiments in the home computing market. They weren't nearly as fast or powerful as other computers of their time, yet in many homes they continue to fulfill the role that visionaries once predicted for them: they've evolved from somber, cold pieces of machinery to tools that are useful and fun.

In 1984, Adelaide Zimmerman decided to purchase a PCjr, hoping it would help one of her children with his schoolwork. Despite problems getting the system running, Zimmerman eventually succeeded and converted her whole family—all ten children—into computer enthusiasts.

Zimmerman has since added a new keyboard and modem and upgraded to 640KB RAM. The refurbished machine is pressed

### Columbia-Baltimore User Group, Inc.

P.O. Box 125  
Columbia, Md. 21045  
Contact: Ed Bachmann  
301-730-1127

*One-third of the group's 380 members still own Columbias, though the group has expanded to cover IBMs and compatibles. Monthly meetings and newsletter. BBS 301-997-1918. Annual membership \$20.*

## EAGLE

### USER GROUPS

#### Eagle Computer User Group

P.O. Box 3381  
Saratoga, Calif. 95070  
Contact: Jerry Davis  
408-972-1965

*Monthly meetings and newsletter. Annual membership \$15.*

### PARTS AND SERVICE

#### Morgan, Thielmann and Associates

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#### Wilkinson Software

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714-724-1294

*Offers parts and service for all Eagle series computers. Also stocks upgrade parts such as accelerators, hard disks, and expansion boards. Sells a BIOS upgrade to increase compatibility. Maintains telephone technical support.*

## TI 99/4A

### USER GROUPS

#### Boston Computer Society

One Center Plaza  
Boston, Mass. 02108  
617-367-8080

*The country's largest user group. Its TI SIG publishes a newsletter, holds meetings, and operates a bulletin board for members only. It also maintains a software library. Annual membership \$35.*

#### Chicago TI User Group

P.O. Box 578341  
Chicago, Ill. 60657  
Contact: Bob Demeter  
219-659-5628

*The largest TI organization, with nearly 550 members. Meets ten times a year, publishes a newsletter, and sponsors an annual computer fair. Annual membership \$18 for attending members, \$21 for nonattending members.*

#### LA 99er Computer Group

P.O. Box 67879  
Los Angeles, Calif. 90067-1079  
Contact: Terrie Masters  
213-271-6930

*Conducts monthly meetings and publishes a newsletter; also sells third-party hardware and software and sponsors a yearly computer fair. Annual membership \$20.*

### PARTS AND SERVICE

#### MYARC, Inc.

P.O. Box 140  
Basking Ridge, N.J. 07920  
201-854-5843

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P.O. Box 8123  
 San Francisco, Calif. 94128  
 800-227-6900

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**PUBLICATIONS****Genial Traveler**

835 Green Valley Dr.  
 Philadelphia, Pa. 19128  
 215-483-1379

Editor: Barry Traver  
*Quarterly magazine-on-a-disk with articles, programs, tutorials, and games. \$36 for six issues.*

**MICROpendium**

P.O. Box 1343  
 Round Rock, Tex. 78680  
 512-255-1512

Editor: Laura Burns  
*Monthly. Annual subscription \$20.*

**VICTOR****USER GROUPS****Bay Area Victor User Group (BAVUG)**

1493 Beach Park Blvd., #180  
 Foster City, Calif. 94044  
 Contact: Franz Hirner

415-349-3602 (weekends)  
*Monthly meetings and newsletter. BBS 415-574-7914, 24 hours a day, open to all. Annual membership \$35.*

**PARTS AND SERVICE****Victor Technologies**

2166 W. Park Pl., Suite C  
 Stone Mountain, Ga. 30087  
 404-498-6175

**PCjr****USER GROUPS****Metro PCjr User Group**

11732 Cherry Grove Dr.  
 Gaithersburg, Md. 20878  
 Contact: Carl Haub

301-869-4874  
*Monthly meetings and newsletter. BBS 301-468-0984. Annual membership \$20.*

**PARTS AND SERVICE****Computer Reset**

P.O. Box 461782  
 Garland, Tex. 75046  
 214-276-8072

*Sells hardware and software for the PCjr. Also provides service.*

**PC Enterprises**

P.O. Box 292  
 Belmar, N.J. 07719  
 800-922-7257  
 201-280-0025

*Sells hardware and software for the PCjr. Free catalog available.*

**Triton Products**

P.O. Box 8123  
 San Francisco, Calif. 94128  
 800-227-6900

*Offers PCjr software and hardware, including floppy disk drives and an adapter cable to connect an XT-compatible keyboard. No service.*

**PUBLICATIONS****jr Newsletter**

P.O. Box 163  
 Southbury, Conn. 06488  
 No phone.

*Monthly newsletter. Also supplies compatibility disks.*

into service for a variety of projects. Zimmerman used the PCjr to revise the bylaws of the Illinois Fox Valley Embroiderers Guild. Her 12-year-old son runs graphics for school projects. Six family members store their résumés on the system, and at last count the family owned 29 games.

In Tucson, the Mathis family owns three TI 99/4As. BJ Mathis, a church clerk, uses one of the machines to generate financial reports and meeting minutes, while her husband, an Air Force sergeant, often programs in assembly language. Their two sons write reports for school and play games on the TI setup in the den. "It gives them some background so that when they go to school and come across an Apple, they'll at least know how to get started," says Mrs. Mathis.

Admirers of older machines feel an emotional tie to their computers, the way some people feel about a favorite pair of blue jeans that took years to break in. Owners often feel a special bond not just with their machines but also with other owners.

Discovering that it's sometimes hard to love 8 or 16 bits in a 32-bit world, they find camaraderie in the company of fellow orphan buffs. "It's great to find a board where I won't be teased, laughed at, or pitied for owning a Kaypro 2! Thanks for supporting us orphans!" one woman enthused on the bulletin board of the Washington Area Eagle User Group, a 70-member organization that supports all orphaned machines.

TI computer owners are "a real community," says BJ Mathis. "I don't know what makes us hang on, except that we get to caring about each other, and it's difficult to walk away from friends." She adds, "When someone upgrades

to an IBM, it's known throughout the community."

**Parting Is Sweet Sorrow**

But there can come the time when it's no longer financially feasible to hang on to the old machine. When Ralph Gallagher took on a book project that required a large amount of computer memory, it no longer made sense for him to continue upgrading his Osborne 1. "There were hard disks available for the CP/M machines, but for the cost of a 20MB add-on I could buy an XT clone," says Gallagher, an attorney. Moving on isn't always easy. Occasionally, owners of older systems send them to FOG's offices so they might find further use. "They couldn't bear to dump them, so they send them to us and we use them for spare parts," says Gale Rhoades.

Boardman Moore, a retired mechanical engineer in Lafayette, California, knows that the end is near for his Victor 9000, which he's relied on since 1983 for word processing and spreadsheets. He recently tried unsuccessfully to find a MIDI interface for his Victor. Moore minces no words about the future of his machine. "Frankly, I'll probably dump it in about three years," he says, adding that by then he expects the PC market to have taken a clearer direction.

Maryland schoolteacher Chet Pryor keeps his eye on new equipment, too, but wants to see prices stabilize before he gives up either his Televideo Excel or his NEC 8500 CP/M laptop. A member of the Washington Area Eagle User Group, Pryor admits to a fondness for the old machines and the groups that continue to nurture them. "The companies are long gone, yet there are still people supporting them," he says. "It's an amazing phenomenon." ▮



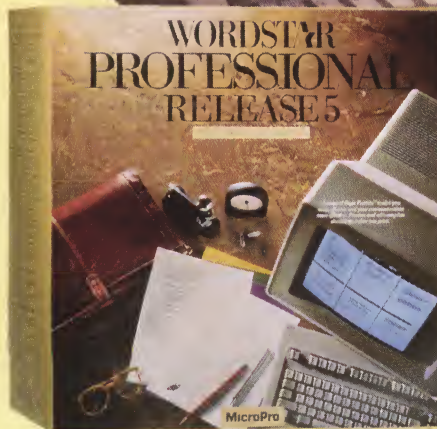
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# New Life for Old PCs



**S**ometimes it doesn't pay to be a pioneer. New World discoverer Christopher Columbus died in debtor's prison. Early feminist Joan of Arc went up in smoke. And those of us who were the first on our block to buy a PC—well, we're now suffering our second round of ridicule.

Way back when, friends and workmates made fun of our decision to spend an arm and a leg for one of the first PCs. "You paid \$4,000 for a computer to do your household budget? Sheesh!"

Yet we who were dubbed "early adopters" by the industry felt in our hearts that we were right, and that eventually those who mocked us would see things our way.

We *were* right, sort of. Lots of those friends and workmates now have PCs of their own. The only thing is that, because they waited, they've been able to purchase vastly more powerful machines for

a fraction of the cost we pioneers were forced to pay. So now, when they come by, the joke has changed to, "Wow, an antique PC! Does it have a starter, or do you have to crank it up?"

This time the jokes really hurt, because they're true. We plod along on machines so slow that we schedule mealtimes around recalculating a spreadsheet, while everyone else can do the same thing in the blink of an eye.

If this sad tale sounds familiar, or if the PC or AT that seemed so speedy a few years ago feels like a turtle when you try to run today's huge, processor cycle-hungry software, maybe it's time to upgrade to something with a little more juice. There are several ways to do so: you could buy a new computer, or add an accelerator (turbo) board to your current setup, or buy a high-speed motherboard to replace the one your machine

**Pep up your elderly XT  
or AT for a fraction of  
the cost of a new machine.**

**By FRANK BICAN**

ILLUSTRATION BY ANDERS WENNGREN



has now. Of these three alternatives, a motherboard swap may make the most sense.

Turbo boards may be attractively priced and as simple to install in a PC expansion slot as any other board. But they don't improve performance as much as you might expect, because they rely on the host computer's relatively slow data bus to move information to and from the peripherals. Further, turbo boards are unlikely to be compatible with future operating systems, or will run them poorly at best.

Buying one of the latest 80386-based PCs is a surefire way to get more speed, along with compatibility with multitasking operating systems such as OS/2. It's also an expensive proposition, especially if you choose a computer with an entirely different bus structure, such as the Micro Channel bus found in several of IBM's PS/2 computers. That means buying all-new peripherals and expansion boards, too.

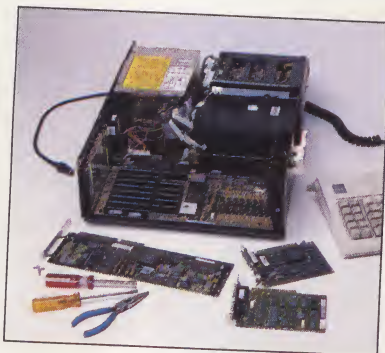
That leaves the replacement motherboard as perhaps the most cost-effective way of getting more mileage out of an aging PC. For as little as \$2,000 (depending on the amount of memory you purchase) and an hour of your time, a 386 motherboard can boost the performance of a standard PC by as much as 25 times. Even an AT's performance can be tripled with a new, 80386-based motherboard.

You might be tempted to economize and go with a high-speed 80286-based motherboard, but you'd be well advised to resist. Along with a faster microprocessor, most 80386 motherboards are also equipped with at least one 32-bit expansion slot intended for high-speed memory boards, which is almost as important to throughput as processor speed itself.

Buying a replacement motherboard offers substantial cost savings compared with buying a new system. Your old PC's cabinet, keyboard, disk drives, and expansion boards will all work with a new motherboard.

Of course, many people associate opening a computer's case with performing a

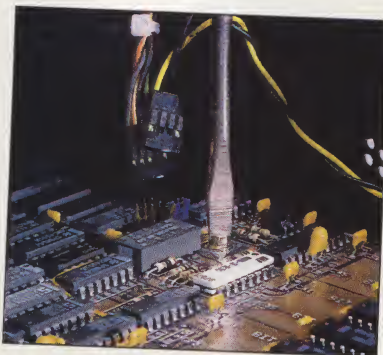
*Frank Bican is a computer resources supervisor at a medical center in Cleveland.*



**1** Disconnect the power, monitor, and keyboard cables. Open the PC and remove all internal expansion cards, carefully noting the position of connectors on the disk drive controller.

craniotomy; they're reluctant to look inside, much less take it apart. The truth is that the components inside a PC are a lot more durable than the people selling service contracts or static

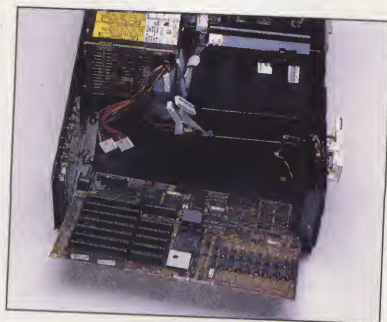
protection devices would like you to believe. Depending on the type of computer you have and the motherboard you are installing, all you may have to do is remove your PC's expansion boards and power cables, snap the old motherboard out of its mounting posts, and pop the new one in. For other systems, you may need to remove the disk drives and



**2** After disconnecting the power supply wires, unplug the battery, lock, and speaker leads. Remove the two screws that hold the motherboard to the chassis.

the power supply, but even this requires only a screwdriver and a little patience. The job gets a bit more complicated if you install an XT-sized motherboard into an AT chassis; you might

have to drill new mounting holes in the cabinet. You may also need to replace your PC's power supply as part of the motherboard transplant. If you have an AT, XT, or XT Model 286 you should be in fine shape, but a standard PC's paltry 63-watt power supply just doesn't put out enough juice to handle a 386 board. You can buy a 150-watt power supply



**3** Remove the motherboard from the case by sliding it about 1/2 inch, lifting slightly, then sliding the rest of the way. Using needle-nose pliers, crimp the retaining flanges on the four supporting spacers until they pop out of the board.

from a mail order house for \$50 to \$70, and installation takes no more than five minutes, so this shouldn't be much of a problem.

The primary consideration in selecting a replacement motherboard is the size of the cabinet in which



it will be installed. Those designed to fit into a PC or XT can often fit into an AT as well, but those made specifically for an AT will probably not fit into a smaller chassis.

Compatibility with your existing software could also be a minor problem. Because you're replacing your old BIOS (basic input/output system) chips with the BIOS on the new motherboard, some programs that ran just fine may need to be replaced with generic versions. This is particularly true when you attempt to run BASIC programs using the IBM BASIC interpreter on a non-IBM board. The problem can usually be solved by replacing the interpreter with one intended for generic use, such as Microsoft's BASIC. You may encounter a similar problem when trying to use IBM's PC-DOS rather than its generic equivalent, MS-DOS.

The one area where the replacement motherboard might not live up to expectations is in the speed of the peripherals plugged into it. An XT-class hard disk and its 8-bit controller won't give the same throughput as systems based on quicker hard disks and 16-bit controllers. This isn't much of a problem if you're looking for faster spreadsheet recalculations, but it could prove frustrating with disk-intensive activities such as database searches. Of course, once you've installed the new motherboard, you can purchase a 16-bit controller and a faster hard disk.

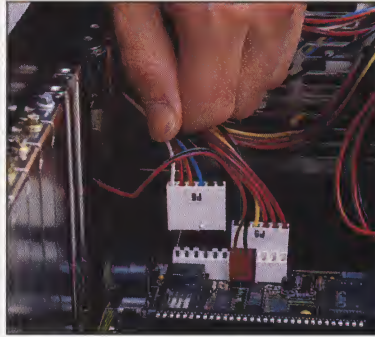
Another thing you should consider is the availability of expansion memory. Most of the products reviewed here come with 1MB to 2MB of RAM and can be expanded to address up to 16MB. Unfortunately, at this time there is no widely accepted design standard for 32-bit memory boards, and thus you're usually dependent on the manufacturer of the replacement board to furnish memory expansion boards as well.

### Dyna SX386

While it is not uncommon for manufacturers of replacement motherboards to offer different versions to fit into PCs, XTs, and ATs, these boards are generally fairly similar in design and performance. But Dyna Computer, of San Jose, California, makes such different designs for the XT and AT that we decided to take a close look at each of them.

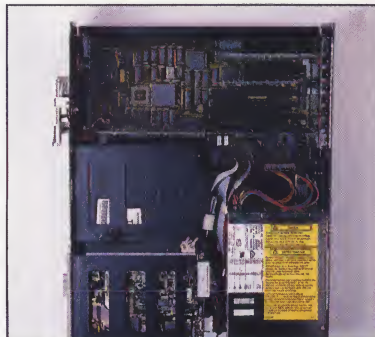
Dyna's SX386 appears, at first glance, to be just

the ticket for turning an aging XT into a power user's dream. When it comes to sheer processing speed, the SX386 motherboard—which, despite its name, utilizes a standard 80386 CPU, not the slower 386SX version—proved the quickest of all. It's nearly three times as fast as an AT and a whopping 23 times as fast as an XT. That kind of performance boost is just what you might expect from a board with a 24MHz clock speed—among the fastest available.



**4** Insert the plastic spacers (feet down) into the proper holes in the system board. Slide the new board into the case, making sure it is seated properly. Replace the screws and reconnect the power supply, battery, speaker, and lock leads.

But there may be a dark side to the lofty performance of the 24MHz version (the Dyna SX386 also comes in 16MHz and 20MHz versions). Dyna has equipped the board with an Intel 80386 microprocessor rated for operation at just 20MHz. Although the board we tested ran fine, running the microprocessor faster than its rated speed could result in reliability problems or system failure should the microprocessor become overheated during ex-



**5** The complete system. Be sure everything is installed correctly before reconnecting the power cable. Remember to attach the disk activity light lead to the disk controller card. Finally, set any required dip switches and note your disk drive type before closing the case.

tended use. Although it may work just fine again after cooling down, the data you were work-

ing with may not recover so easily.

You can install up to 8MB of memory on the Dyna SX386 motherboard in the form of single-inline-pin memory modules (SIPs) that squeeze in opposite its three 16-bit expansion board slots. This unusual arrangement shouldn't be a problem with most expansion boards, but some thicker-than-standard boards, such as the Plus Development HardCard and certain video adapters, will probably fit only into one of the four 8-bit slots or the single extra 16-bit slot, which are not so encumbered. The Dyna SX386 also offers a single 32-bit high-speed memory slot.

The documentation supplied with the SX386 should be adequate for those with some technical



background, but newcomers would certainly welcome a few drawings or photographs to illustrate the instructions.

Since the SX386 features the appropriate mounting holes and plastic standoffs to fit into an AT as well as an XT, the board functions as something of a universal upgrade. And for pure speed you can't beat the 24MHz version of the SX386, which sells for \$2,490 with 2MB of RAM. But it might be better to err on the side of caution and look at the 16- or 20MHz version of the SX386.

### **Dyna Granite 386 20**

Considering that the SX386 performs quite well and can be used in either an XT or an AT, one can't help but wonder just what market segment Dyna's other motherboard, the Granite 20, is aimed at. Since it is too large to fit into anything but a full-sized AT chassis, is more expensive (\$2,599 with 2MB of memory) than the SX386, and offers no performance improvement, it really has little to recommend it over its sibling.

In addition, the made-in-Taiwan Granite 20 suffers from both dated technology and lackluster quality control. The former is evident in the board's use of conventional logic chips rather than the Chips and Technologies logic arrays that keep the SX386 motherboard so clean and uncluttered. Consequently, the Granite 20 leaves no room on the motherboard for any memory chips. The 2MB of memory included with the system is installed on a dedicated 32-bit memory board. Should more memory be required, an 8MB board can be substituted, but further memory would have to be added in one of the board's slower 16-bit expansion slots.

Indifference to quality control was evident in the shoddy way two of the 16-bit slots were soldered onto the motherboard we tested—one so badly that there was no way to install a board in it.

The Granite 20 should be installed in an AT chassis by a dealer or by your resident hacker, because the documentation supplied with it is unnecessarily technical and says nothing about the physical aspect of installation.

If you can live with these limitations, you'll find the Granite 20's performance on a par with most of its competitors, boosting performance to almost three times that of a conventional AT.

One unique feature offered by the Granite 20 is that it has separate sockets for 80287 and 80387 numeric coprocessors. This allows you to use the 80287 chip you already have to enhance the speed of programs that can use it (such as Lotus 1-2-3 and AutoCAD) until the price of 80387 math chips comes down from its present level (which is about as high as the ozone layer).

The ability to use the 80287 without an adapter board, though, is just not enough to recommend the

Granite 20 over Dyna's own SX386, not to mention the other boards reviewed here.

### **Hauppauge 386 MotherBoard/AT**

Just when you thought that the entire U.S. computer industry had abandoned its manufacturing facilities for Taiwan or Singapore, along comes Hauppauge Computer Works to show that we can still do things better than many of our competitors—and maintain a competitive price.

Hauppauge takes its name from the place it calls home—Hauppauge, New York. Its 386 MotherBoard/AT may well be the best 386 replacement motherboard yet for AT-sized systems.

For one thing, Hauppauge offers the most complete package of the lot. Along with the motherboard, the company provides a surprisingly good manual, a diagnostics diskette, a battery holder (complete with the required three alkaline AA batteries), and even a little aluminum Hauppauge 386 logo you can place over the IBM PC AT logo on your cabinet.

The motherboard itself displays exemplary workmanship. If it were a camera, its construction quality would be comparable to that of a Nikon FTn—precision at its finest.

There are eight expansion slots on the \$1,795 Hauppauge motherboard, which comes with 1MB of memory. Four of these are 16-bit bus slots, perfect for such components as the hard disk controller and AT multifunction boards. Three slots are intended for 8-bit bus add-ins, such as a video adapter and modem. The last is a high-speed 32-bit slot for a proprietary Hauppauge memory board that can hold as much as 14MB of memory.

If honesty is the best policy, then the 386 MotherBoard/AT certainly earns its merit badge. Although some other manufacturers push components beyond their limits in the interest of speed, Hauppauge runs its 16MHz 80386 CPU at just that speed, not beyond, guaranteeing the integrity of your data in the hottest of environments. The Hauppauge board boosts performance to roughly 2.7 times that of a standard AT, so it should satisfy all but the most power-mad user.

As you might expect from a board designed by a group of Intel expatriates, the 386 MotherBoard/AT is exceptionally compatible with existing IBM applications and peripherals, so much so that it will even run IBM's own version of OS/2. Some other boards require dedicated versions.

Special mention must be made of the installation guide that Hauppauge provides. With its helpful photographs and setup tables, installation turned out to be a breeze.

Hauppauge also makes a similar board sized to fit earlier PC and XT systems.

For a relatively new product in a very new market niche, Hauppauge has done its homework well, and



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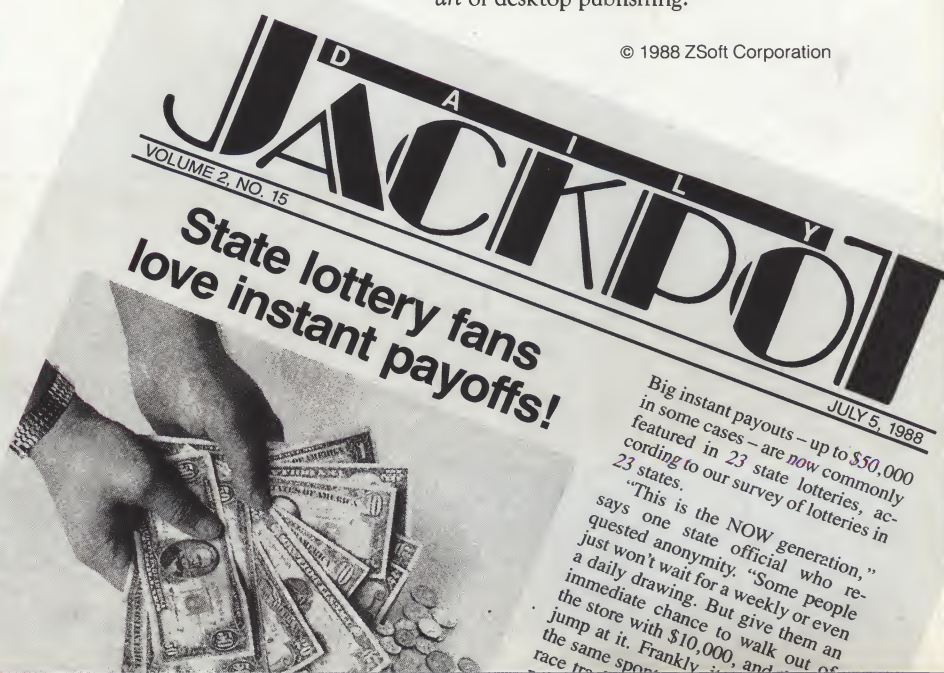
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the 386 MotherBoard/AT is unquestionably at the top of my list.

### **Intel iSBC 386ATZ**

Inasmuch as the Intel Corporation, of Santa Clara, California, is the company that designed the microprocessor found on all of the motherboards tested here, it should be no surprise that it also manufactures an excellent replacement board for your aging AT. The board should enjoy popularity in sheer numbers alone, since it's found in the majority of mail order 80386 systems made today.

Rather than design this board around the Chips and Technologies logic arrays used on most replacement 80386 motherboards, Intel has used conventional logic chips. This in no way hampers the board's performance, but it sure makes for an imposing sight when you first take it out of the box.

In its latest revision, the iSBC 386ATZ comes standard with 2MB of memory (in the form of eight SIPs) on the board itself. If more memory is required later on, there are two high-speed 32-bit expansion slots, as well as four 16-bit slots for AT-type cards and two 8-bit slots for a modem or other accessories.

Also new to the iSBC 386ATZ is a setup program in the Phoenix ROM chips. No longer will you have to hunt down an AT setup disk when installing new hardware into your system.

The Intel motherboard is one of the few that has connectors for a serial port and a parallel printer port right on the board. This prevents you from paying extra for an input/output board.

By an ever-so-slight margin, the iSBC 386ATZ was the slowest board we tested. This was not unexpected, since the 80386 runs at a conservative 16MHz. Although it may not win any races, the slower clock speed should result in reliable operation and give you confidence that your data won't get scrambled at an unexpected moment. In any case, it still offers more than double the performance of your AT.

Intel doesn't market the iSBC 386ATZ directly to individuals, but several mail order companies will sell you one. Check their ads for prices, and be sure to ask whether they provide installation instructions—the board sent to us from Intel came with none.

Versatile, complete, and reasonably fast, the Intel iSBC 386ATZ is a great choice for a corporate information center that wants to update a number of ATs to the 80386 performance level. With no instructions and a fair number of configuration jumpers to set, though, it may not be the best choice for your first-time venture into your computer's cabinet.

### **Monolithic MicroFrame 386**

The MicroFrame moniker is a rather obvious takeoff on the name for the monstrous computers used in business. Since the MicroFrame board processes information at a rate of over 3 million instructions per

second, the name is quite appropriate.

The Monolithic Systems Corporation, of Englewood, Colorado, has an even closer link to the mainframe market: it has been building memory products for the big systems for 19 years. That rich experience has resulted in a quick, well-made replacement motherboard for your AT.

The MicroFrame 386, while substantially faster than any 80286-based AT ever made, is something of a mixed bag when stacked up against its rivals. Its CPU, working at 20MHz, boosts the speed of spreadsheet recalcs and desktop-publishing image modifications by roughly three times, but the board's performance when accessing the PC's extended memory segment (that beyond the first 640KB) is slightly slower than that of the others. This shouldn't be a problem for most DOS applications, but it will hinder a few, such as virtual disks and perhaps future applications running under newer operating systems.

The MicroFrame's construction quality is a notch above average, and a number of features should allow you to install it in just about any AT-compatible chassis, not just IBM's. Connectors are included on the board for such non-IBM accoutrements as a "running" light (which indicates that the computer hasn't halted with no warning) and a hardware reset switch (so that if it ever does fade off into never-never land, it can be restarted without turning the power off and on).

To further reduce the complications of installing the MicroFrame 386 into your AT clone, Monolithic Systems has provided two different battery connections on the board—one for a conventional AT-type battery, and a second for button-style lithium batteries.

Unlike the other boards we reviewed, the MicroFrame has only two 8-bit and six 16-bit board slots on it, without the usual dedicated 32-bit memory expansion slot. This will limit you to only (!) the 8MB of memory that can be installed on the board itself.

Two areas in which this motherboard gets less-than-perfect marks are in its documentation and power-on self-test. The manuals are rather technical and have no instructions for the physical installation itself, and the power-on memory test takes roughly four times as long as that of the other boards for the same amount of memory. The latter is more of a nuisance than anything else, because you'll probably have to endure it only once a day.

At \$3,678 (with 2MB of memory), the Monolithic MicroFrame is a great (if somewhat expensive) solution for upgrading your PC AT. But with its connectors for a running light and a hardware reset switch, it may be better suited for putting new life into one of the many AT clones that sport such features than for an IBM machine. In order to use those features on an IBM PC AT, you'd would have to drill several holes in the chassis. ■



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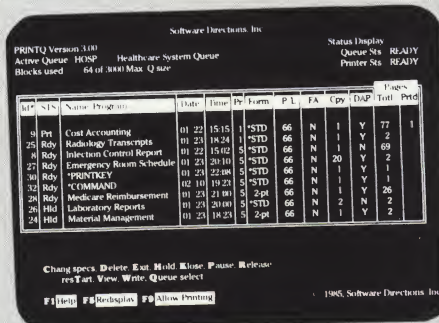
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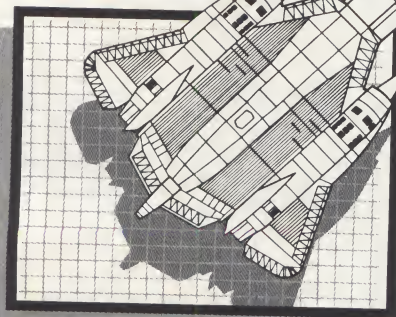
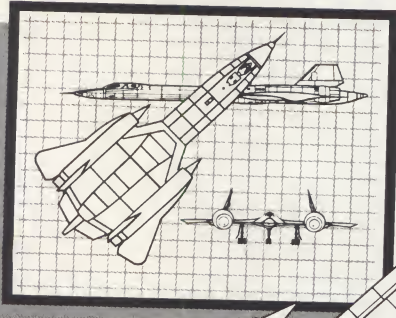
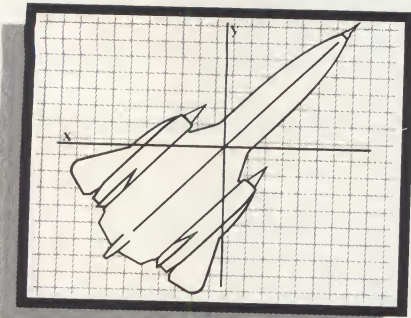
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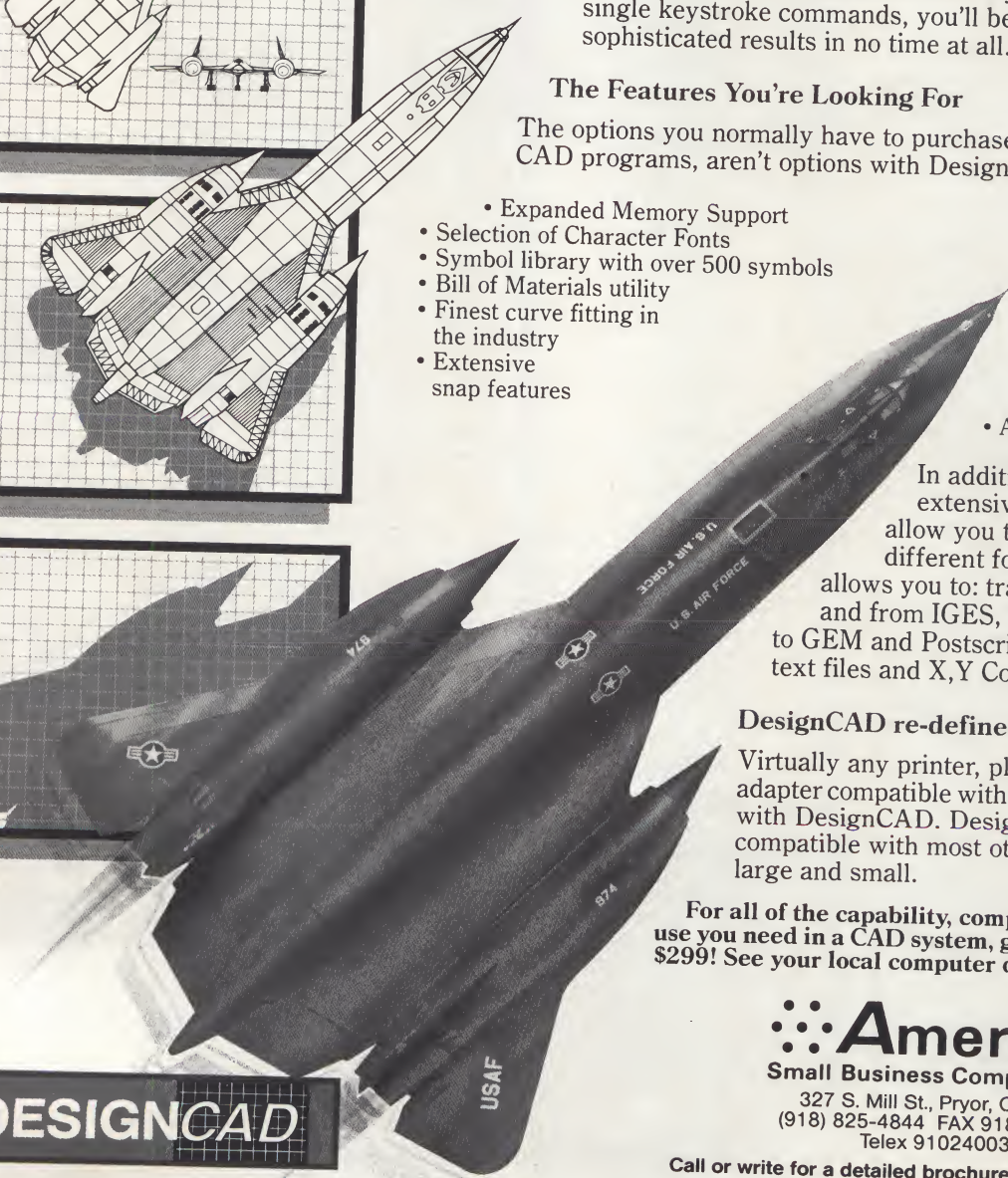
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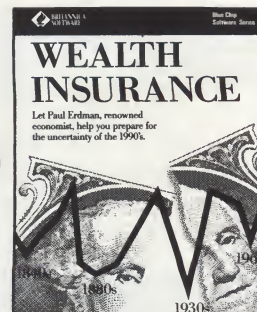


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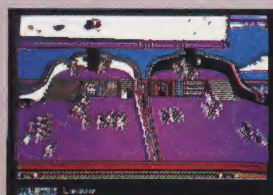


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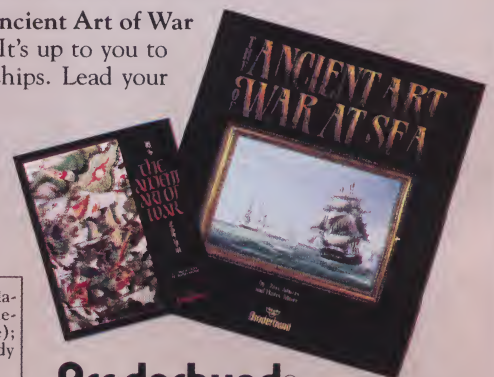
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# Deskpro Power and Glory



**T**hose adventurous souls who bought the Compaq Deskpro when it first appeared on the market in 1984 thought they had purchased the ultimate dream machine. Talk about screaming speed! A rating of 1.7 on Peter Norton's Sys Info (or SI) benchmark—nearly twice as fast as a bona fide IBM PC.

That was, of course, before the AT, before the NEC V-30 microprocessor, before faster internal clocks for 8088-based machines, and before computers based on Intel's 80386 microprocessor. Today, with the least expensive AT clone earning an SI rating of 9.0 or better, the Deskpro's screaming 1.7 suddenly sounds like a whimper.

So what to do? Buy a computer based on the Intel 80286 chip, which was introduced in the IBM PC AT? An IBM or Compaq that uses the 80286 would make your wallet whimper.

Well then, why not do what so

many owners of IBM PCs have done—turn your old machine into an AT compatible by installing an expansion board with an 80286 microprocessor. That way you get to keep the

Compaq brand name on your desk, save the trouble of getting rid of your old computer, and forget about swapping umpteen megabytes of data from your old hard disk to a new one—all while saving hundreds to thousands of dollars.

But until just a few months ago, an expansion-board upgrade to AT performance wasn't possible for a Compaq Deskpro. Ironically, the features that originally made the Deskpro a speedster have also made it unable to use most 286 speed-up boards.

The Deskpro uses Intel's 8086 microprocessor, a close cousin of the 8088 chip in the IBM PC. The difference between the two is that, although both processors manipulate data internally 16 bits at a time,

**An accelerator board  
can restore the sizzle  
to an aging Compaq.**

**By RON WHITE**



the 8088 uses an 8-bit data bus, whereas the 8086 has a 16-bit data bus. (The bus is the path that transfers signals among the computer components.) Consequently, while both processors did equally speedy jobs of juggling data, the Deskpro was faster at getting that data to other components where it could be put to use.

Since the AT also has a 16-bit data path, the Compaq Deskpro would seem to have a head start when upgrading to an 80286 processor. Maybe so, but most manufacturers have chosen to design boards for the PC, which means they have to allow for an 8-bit data bus. That, in turn, means their 80286 boards won't work on a Deskpro or other computers with an 8086, such as the AT&T 6300, Olivetti PC, Amstrad PC, and IBM PS/2 Models 25 and 30.

Two companies have come to the rescue of owners of 8086 processor-based Deskpros who want AT-class performance but don't want to abandon the hardware they already have. The 286 Express/30 from PC Technologies and the SOTA 286i from SOTA Technology both provide the power of an AT for less than the cost of the cheapest AT clone.

### **The Fast Lanes**

Both PC Technologies' 286 Express and the SOTA 286i make a Compaq Deskpro run up to five times as fast. But there are some differences between the two boards.

One not-so-subtle difference is that the 286i has a toggle switch on the bracket that fits into the back of the computer. The switch is supposed to swap operations between 8086 and 80286. The board would not

**Installing an accelerator board in your 8086-based computer gives you a faster machine, but it doesn't give you an AT. You're still left with an XT-class hard disk and low-capacity floppies.**

operate with the switch in the 8086 mode. A phone call to SOTA yielded the explanation that, since the board is only a few months old, some bugs have been encountered. That one is being fixed, a SOTA spokesman said.

The 286 Express board, on the other hand, uses a software toggle to switch back and forth between the two modes. When switched to the 8086 processor, the computer ran without a hitch and produced the

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*Ron White is a news editor of the San Antonio Light and founder of a San Antonio IBM compatibles user group.*

expected Norton SI rating of 1.7, just as an unmodified Deskpro would.

Many users, however, may not care if the bug in the SOTA board is ever remedied. After all, anyone who gets either of these boards wants speed. The ability to run in the 8086 mode would be important only to someone using older software that doesn't work in an AT-class environment or has built-in timing that expects the ancient 4.77MHz clock rate of the IBM PC. But if extra speed is important enough for you to buy one of these boards, you probably should also be updating your software.

Both boards were able to run almost all the software that I could find to test on them. Significantly, they ran Windows 286 and Microsoft Excel, both of which are designed specifically for the 80286. Trying to run Excel on my Deskpro without either board installed froze the machine colder than an arctic iceberg.

I encountered one problem while running my favorite game, Ikari Warriors, a Rambo-type amusement that boots under its own operating system. It ran perfectly on the SOTA 286i, but although it booted on the 286 Express, after a few minutes of playing, the computer's screen went blank, and I had to hit the switch to reboot.

The only other software conflict I encountered was with the timing on some macros that had been created with WordPerfect 4.2 and with Keyworks, a memory-resident program that records keystrokes. I was able to modify the macros to allow small pauses to compensate for the super-fast operation of the accelerator boards.

### **Speed Tricks**

Speed is one of the primary reasons to upgrade to either of these boards. The 286 Express has a Norton SI rating of 16.7, and the SOTA 286i gets a 14.3 SI, both respectable figures. The difference in the SI ratings is primarily a factor of the clocks used in the two boards. The 286i runs at 12.5MHz, and the 286 Express uses a 16MHz clock. (Both companies make less expensive versions of the boards, which have slower clocks.)

But Norton SI measures only raw computation power. In benchmark tests that simulate real-world applications, the SOTA 286i outperforms the 286 Express in many areas. This is where trying to compare them gets tricky.

The speed of both boards is enhanced by the presence of 16KB of high-speed memory that caches data flowing between RAM and the microprocessor. The RAM chips that come in most computers are slow compared with the microprocessors. This means that a lot of the computing power of the 80286 ends up being wasted while the processor is, in essence, twiddling its thumbs, waiting for more data to arrive from RAM.



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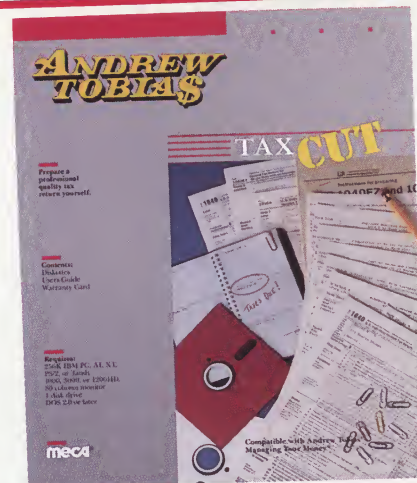
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But the 16KB of zero-wait-state memory on both boards acts as a buffer between RAM and the 80286. The cache memory can spew data into the microprocessor as fast as it can take it. RAM caching on both boards can be turned off, using device drivers or programs provided on disk, if the caching interferes with software operations.

Turning off caching also demonstrates the difference it can make in tests run with a benchmarking program such as The Database Group's Power Meter. (Unlike Norton SI, which checks only processor speed, Power Meter covers several types of processor manipulations and includes output to the screen and disks, the slowest operations on a computer.) In one test designed to emulate the operations involved in such applications as word processing and spreadsheets, Power Meter rates the SOTA 286i using RAM caching at 49.3 PMUs (power meter units—the greater the number, the better). Without caching, the board comes in at 15.0 PMUs. The 286 Express board without RAM caching performs better at 17.5 PMUs than SOTA's board. But using RAM caching, the Express board lags slightly behind the 286i at 46.5 PMUs.

Why would the SOTA board, with its slower clock speed, outperform the 286 Express? The answer is in the design of the boards and in what they cache. The 286i uses a technique called "application-specific integrated circuitry." This means that the circuitry of several components has been condensed into a custom-made set of chips, which also accounts for the fact that SOTA can pack everything onto a half-length expansion board. A SOTA spokesman explained that this technique allows the board to optimize its performance.

Another reason for the faster performance of the SOTA board is that it also caches ROM data and data going in and out of the video memory. The improvement is evident in Power Meter tests designed specifically for video output, where the SOTA 286i scored 826.3 PMUs overall and the 286 Express scored 758.7.

Video caching can be turned on or off on both machines. The default for the 286i is to have the caching on. A PC Technologies-spokesman explained that the default for the 286 Express is to have video caching off, since it can sometimes produce undesirable side effects.

In virtually all cases, the differences between the 286i and the 286 Express are minimal when compared with the improvement over the original performance of an unmodified Compaq Deskpro. With either board the effective speed of the machine is at

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**List Price:** 12MHz version, \$395;  
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Sunnyvale, Calif. 94086  
800-237-1713  
408-245-3366

least twice and sometimes as much as five times as fast, depending on the type of operations involved.

### **Hands On**

Getting either of the boards into your computer is a fairly painless half-hour job.

Installing the 286 Express, in fact, is in many cases simpler than putting a modem board into your computer. The board came pre-configured for a Compaq Deskpro. (There are also models for

the Victor Champion, Tandy computers, and many 8088-based machines.) There are no dip switches or jumpers to set. The toughest part of the installation was removing the 8086 microprocessor from my Compaq and installing it on the 286 Express.

PC Technologies warns that the 8086 in some Deskpros is soldered into its socket (mine was not), and the board's installation manual explains how to remove the Compaq's motherboard so that it can be

**The speed is enhanced by  
16KB of high-speed memory  
that caches data between RAM  
and the microprocessor.  
The cache spews data into  
the microprocessor as  
fast as it can take it.**

taken to a professional to unsolder the chip. The 286 Express board comes with a microprocessor chip removal tool. The chip went neatly into a socket on the board after some minor straightening of pins that had gone askew during its removal.

If your computer has an 8087 math coprocessor, it must be removed. It cannot be used with the 80286 processor, and a dummy chip that comes with the board must be installed in the empty 8087 socket.

A ribbon cable must then be attached to the empty 8086 socket on one end and to a connector on the 286 Express on the other. The hardest decision in the installation was what to do with the excess length of ribbon. The manual suggests removing some of the other boards and laying the ribbon so that it fits under them, but any convenient arrangement will do.

Finally, the 286 Express must be inserted into a vacant expansion slot.

The installation of the SOTA 286i was slightly more difficult, because the board is designed as a "universal" accelerator board that can be used in several different machines. The advantage is that you



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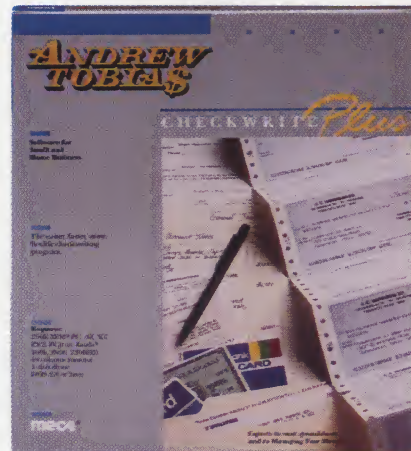
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could someday move it to a different computer. (SOTA claims it also works inside the AT&T 6300, PS/2 Model 30, Tandy 1200, and most other computers using either the 8086 or 8088 microprocessor.) The disadvantage is that you have to fiddle with a block of five tiny jumper connections on the board to tell the 286i what computer it's going in.

Otherwise, the installation of the SOTA board was similar to that of the 286 Express. There was no need to install a dummy chip in the 8087 socket as required by the 286 Express. The 8086 processor must be removed—SOTA also provides a tool—and transferred to the board. And, as with the Express board, a cable connects the empty 8086 socket to the 286i.

### Not Quite an AT

Installing either accelerator board in your Deskpro or other 8086-based computer gives you a faster computer, but it doesn't give you an AT. For one thing, you're still left with XT-class disk drives. My Compaq's hard disk is rated with an 85-millisecond seek rate, which is about as slow as a hard disk gets and which accounts for the less dramatic improvement in tests that involve disk access. And you won't have the high-capacity floppy drives that are standard on AT compatibles, which means you won't be able to read disks for software such as Excel that are

distributed only for ATs. (The only way I could put Excel on the Compaq's hard drive was through a null-modem transmission from an AT clone.)

But the up side is that you get not only faster processing, but also access to expanded memory, such as that using the LIM EMS standard to slip past the DOS barrier of 640KB. In addition, SOTA claims

**OS/2 may be out of the question, but if you're after blazing speed and access to expanded memory, these boards offer a solution.**

that, with the release of a memory board that plugs onto the back of the 286i, its card will be able to run OS/2. The people at PC Technologies doubt this claim and say that running OS/2 is a practical impossibility on anything less than an AT.

If you're convinced the future is with OS/2, then an investment in a new computer may be the better choice—at least until SOTA's claims have been proved. But if what you want is blazing speed and access to expanded memory, either board is a solution you can put to work today. ■



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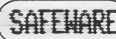
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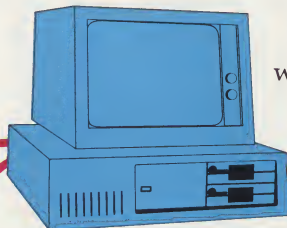
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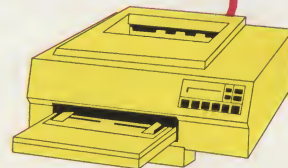


## Transfer files, and a whole lot more with ManyLink.



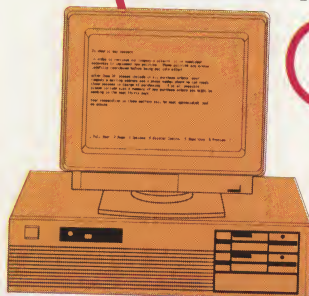
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## Size

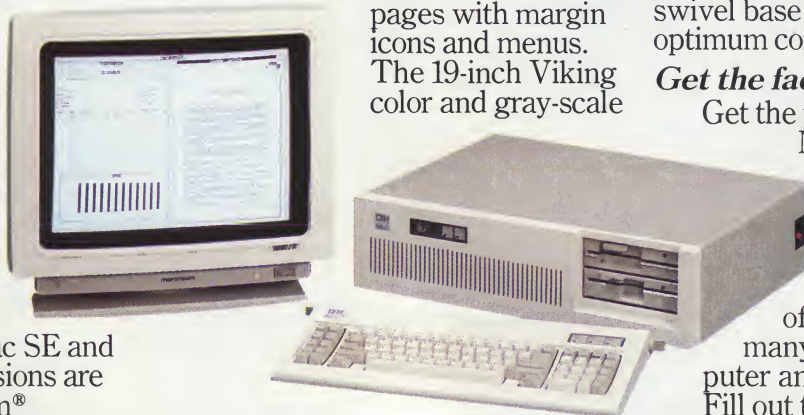
A 15- or 17-inch monitor displays only part of a page. You'll quickly get frustrated scrolling around and never seeing your whole page at once. Viking 19-inch monitors are perfect for double page layout and drawing. And the Viking 24-inch monitor displays two full *actual size* pages with margin icons and menus. The 19-inch Viking color and gray-scale

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Please Check:

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☐ Apple User  
No. of micro-computers \_\_\_\_\_  
☐ Apple Reseller  
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PCC-12





Directory PATH listing for Volume MORSE  
Volume Serial Number is 203A-8086  
C:\

```
├──123-201
├──88BUDGET
├──89BUDGET
├──EXPACCTS
├──CASHFLOW
├──PROMDIU
├──CALIF
├──PROJZ
├──PROFORMA
├──COSTANAL
├──ADVUBDG
├──DOS40
├──UTILS
├──MACE
├──NU40ADV
├──WIN386
├──PIF
├──MSWORD40
├──ITINS
└──1988
```

# DOS 4.0 Takes Command

**New DOS commands  
perform long-awaited tricks  
that will bedazzle even  
power users.**

**By PAUL SOMERSON**

**D**OS was always the program we loved to hate. Since its initial release in 1981, the complaint has been the same: "It works well enough, but it could be so much better." Over the years, IBM and Microsoft corrected bugs and added power. But until IBM's release of DOS 4.0 in July, users still had to run the operating system from the cryptic DOS prompt. DOS 4.0 changed all that—and now there's a lot to like.

DOS 4.0 wraps the operating system in a shell that makes life a lot easier for users who don't want to deal with the prompt. At the same time, power users can escape back to the prompt and run the commands they know (if not love).



Last month, PC/Computing editorial director Paul Somerson reported on this new version of DOS and the features included in the shell. In this, the second in a two-part series, he discusses the new commands you can run from the DOS prompt.

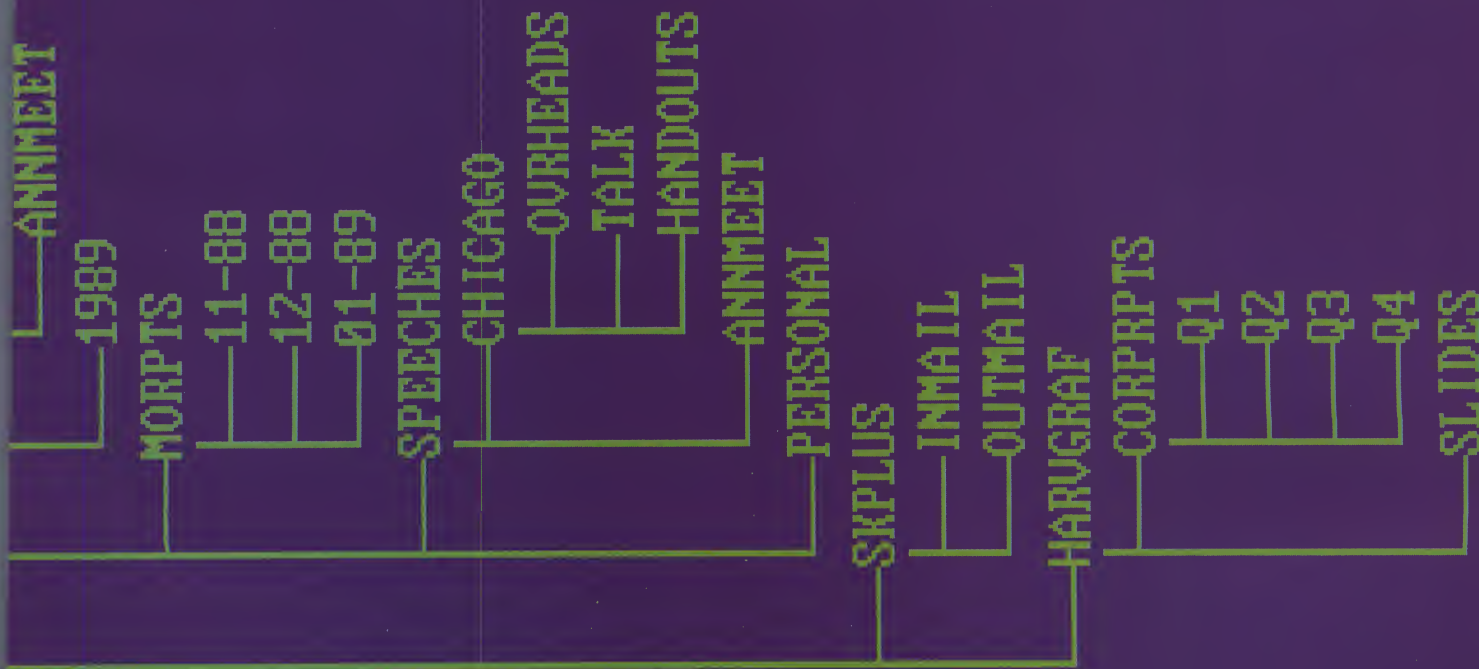
## New, Improved Commands

The best new command is Mem, which tells you the total amount of RAM in your system, including any above the normal 640KB. By adding a /DEBUG or /PROGRAM "switch" at the end of the command, you can have DOS give you an incredibly detailed report of what is currently loaded where in memory, although, since all numbers are in hex notation, this option isn't for everyone. However, it can be extremely helpful if you're trying to shoehorn lots of pop-up programs into memory, since it shows how much RAM each consumes. And it lets you spot ill-behaved public-domain terminate-and-stay-resident (TSR) programs that keep lopping off memory each time you run them.

DOS 4.0 makes it far easier to clean up a file-clogged disk. If you want to wipe out most—but not all—of your .bak backup files, you can now type DEL \*.BAK /P (or ERASE \*.BAK /P). DOS will print the name of each file that has a .bak extension and ask whether or not to erase it. Type a Y, and the file is gone; type an N, and DOS keeps it alive and asks what you want to do with the next one in the queue. What this command really needs, however, is a /V switch that lets you view the first few lines of the file in question before asking whether or not to erase it. DOS's short filenames don't always say what a file contains.

While the Mode command is still frozen in graphics prehistory, with its limited 40/80/BW40/BW80/CO40/CO80/MONO vocabulary, it can now speed up PS/2 program-

The new Tree command in DOS 4.0 presents you with a graphical picture of the directories and subdirectories that exist on your hard disk.





mable keyboards (but not similar AT equipment). The command `MODE CON RATE=32 DELAY=1` will kick a PS/2 into overdrive. Similarly, you can increase the number of lines on a suitable VGA to 50 with the command `MODE CON LINES=50`. You can also boost an EGA to 43 lines, but you need `Ansi.sys` loaded for DOS to handle anything past the default of 25. ANSI now offers an `/L` switch that tries to maintain the extra screen lines when your system is running an application, as well as a `/K` parameter that forces any system to ignore the added keys on an Enhanced keyboard.

Older DOS versions couldn't handle `PrtSc` screen dumps on EGA or VGA systems; DOS 4.0 provides an enhanced `Graphics` command that can—so long as you're using an IBM printer or something close.

Some of the shorter utilities now offer long-awaited tricks. It took IBM several years to realize that a picture is indeed worth 1K of words; the new `Tree` command draws a graphic of your hard disk's subdirectory structure instead of trying to describe it ver-

---

*Paul Somerson, author of PC/Computing's DOS column, wrote the 1,275-page tome PC Magazine DOS Power Tools for Bantam Books last summer and still hasn't run out of words. He's working on a second book now—this one on DOS 4.0.*

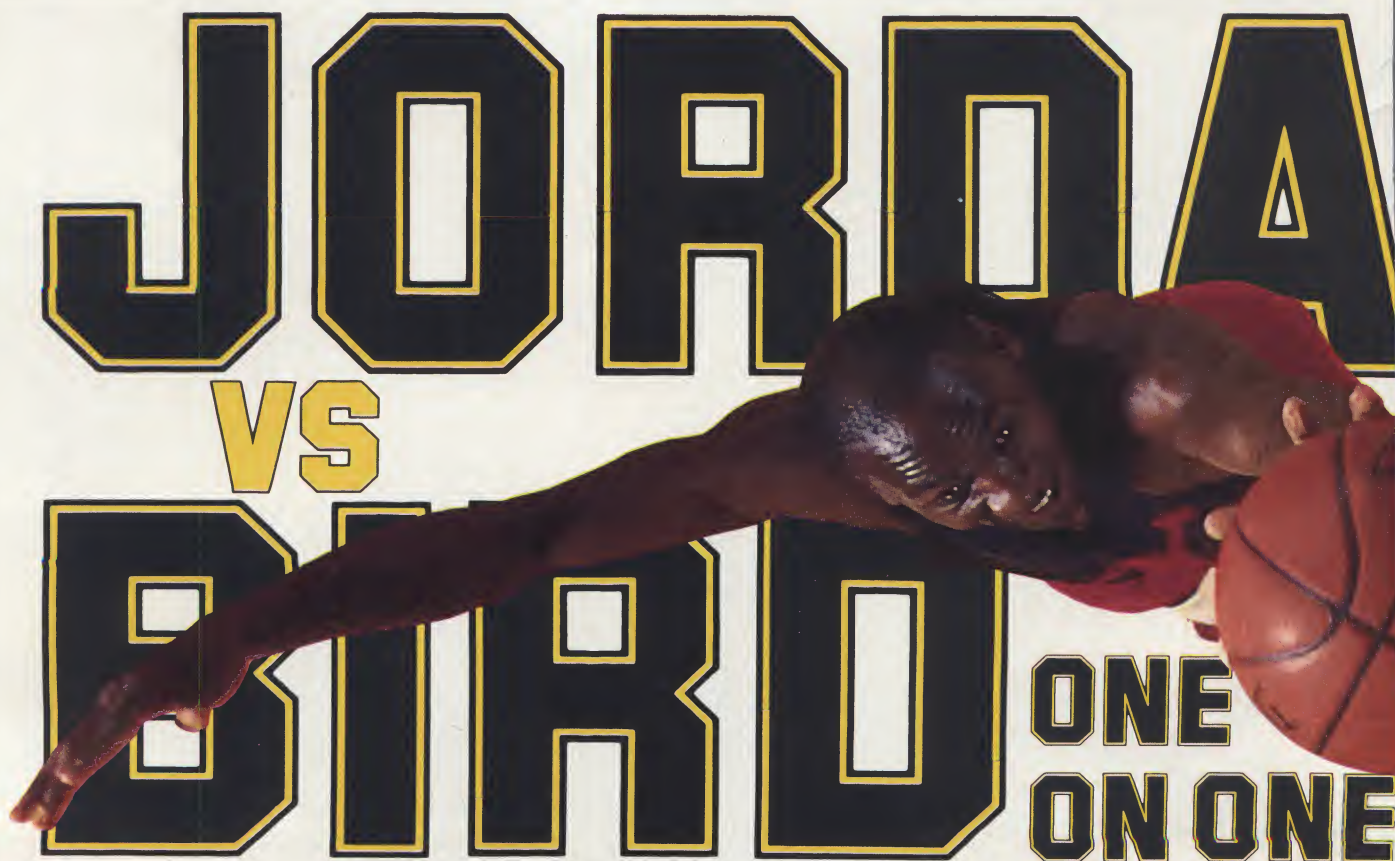
bally. And IBM has finally made it possible to create bootable disks that aren't formatted with the `/S` option. No version of DOS will boot if the system files aren't in the right locations on your startup disk. The

**With this major DOS revision, IBM has attempted to make things a little chummier for the user than before. DOS no longer rattles off head and cylinder numbers when formatting disks.**

`Sys` command now tries to shuffle the hidden `IBM-bio.com` and `IBMdos.com` system files to their proper place at the beginning of a floppy.

### Your Pal DOS

With this major DOS revision, IBM has attempted to make things a little chummier than they were in earlier versions. DOS no longer rattles off head and cylinder numbers when formatting disks; instead, it reports on the changing percentage of disk space as it churns along. This may be better to some, but it will be irritating to anyone forced to deal with 1.2MB/





360KB and 1.44MB/720KB formats in the same drive, which uses the cylinder numbers to verify what size the Format program decided to try. (You can also use percentages rather than strict megabyte sizes

```
C:\123>del *.* /p
```

```
C:\123\DECSALES.WK1, Delete (Y/N)?y
C:\123\BUDGET.WK1, Delete (Y/N)?y
C:\123\PROFITQ.WK1, Delete (Y/N)?y
C:\123\123.COM, Delete (Y/N)?n
C:\123\PGGRAPH.EXE, Delete (Y/N)?n
C:\123\LOTUS.COM, Delete (Y/N)?n
C:\123\123.HLP, Delete (Y/N)?n
C:\123\123.CNF, Delete (Y/N)?n
C:\123\123.DYN, Delete (Y/N)?n
```

**In Version 4.0 you can add a /P option to the Delete command; DOS will display each filename and ask for confirmation before erasing it.**

in partitioning your hard disk.)

Other commands, such as Mode, are a tad friendlier as well. Instead of setting up your communications parameters with a cryptic MODE COM1:12,N,8,1, you now have to enter a far clearer MODE COM1 BAUD=12 DATA=8 STOP=1 PARITY=NONE.

Similarly, Chkdsk now tells you how many "allocation units" (also called "clusters") are available on

your disk. Knowing about this is important, especially if you're trying to copy lots of little files to a disk that's nearly filled. DOS stores files in uniform-size units or clusters. On a typical AT, the cluster size is 2,048 bytes. The minimum amount of disk space that even the shortest file will consume is one cluster. If you copy a small utility program that's only 100 bytes long onto your AT hard disk, DOS will use a single cluster and end up wasting 1,948 bytes. Copy 50 of these files, and DOS will chew up 102,400 bytes just to store files that are really only 5,000 bytes long. So, if you see that you have 16,000 bytes of space left and try to move these 50 small programs to your disk, you'll know why DOS prints an "Insufficient disk space" error message after copying just a few.

DOS 4.0 tries to install Ansi.sys automatically for you, since certain commands require it. If you're using an EGA or VGA monitor, you can tell DOS to display 43 or 50 lines onscreen with a command like MODE CON LINES=50. However, this won't work unless your Config.sys file first loads Ansi.sys (with a line like DEVICE=C:\DOS\ANSI.SYS). Once Ansi.sys is loaded and you learn to generate the Esc+[ prefix it needs, you can change your screen colors or redefine your keyboard nearly any way you want.

However, all the instructions for this are in the optional *Command Reference*. And neither the DOS



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manual nor the *Command Reference* really tells you the best ways to issue the tricky Esc+[ prefix that all ANSI commands need to work. You can do it with the DOS Edlin utility by typing Ctrl-V and then typing the left bracket twice. Or you can redirect the Cls command into a file and then use your word processor to replace the clear-screen 2J command in that

**Other new touches in DOS 4.0 are welcome, if not as dazzling. However, DOS's idiosyncratic way of handling non-American hardware and odd IBM peripherals continues to baffle the known world.**

file with whatever other ANSI sequence you like.

If you want to set your screen colors to blue on white, for instance, make sure the DOS Edlin.com utility is on your disk and type:

```
EDLIN SETCOLOR.BAT <ENTER>
I <ENTER>
@ECHO <CTRL-V> [[47;34m <ENTER>
<CTRL-C>
E <ENTER>
```

Here <ENTER> means "press Enter," <CTRL - v> means "hold Ctrl down and press V," and <CTRL - c> means "hold Ctrl down and press C." If ANSI is loaded, once you're back at the DOS prompt, you can give yourself a blue-on-white screen on a suitable color monitor by typing Setcolor.

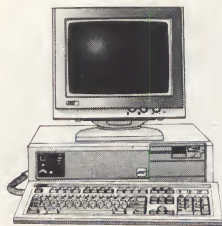
### What Else Is New

Other new touches are welcome, if not as dazzling. DOS 4.0 lets you enter the time in the normal 12-hour format rather than forcing you to convert everything to a 24-hour clock. You can now load TSR programs in your Config.sys file by using a new Install= command. The Switches command allays any confusion between 84- and 101-key keyboards by telling the system to treat Enhanced keyboards as if they lacked extended functions. And the system now adds a four-digit hexadecimal serial number (such as 2A2A-369C) to everything that it formats; presumably this is done to prevent you from swapping disks at the wrong time.

In addition, IBM has updated and enhanced several other commands, such as Fastopen, Buffers, Backup, Replace, Append, Chkdsk, and Rem. However, it continues to baffle the known world with its idiosyncratic system of handling non-American hardware and odd IBM peripherals. ■

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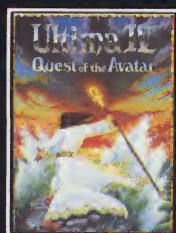


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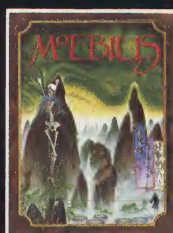
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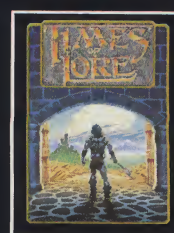
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# EUROTECH

By PETER WHITE

**M**ost people first heard the word "hypertext" about a year ago, when Apple launched HyperCard. It looked like another original breakthrough from the only company that has had the stamina to continually buck the IBM PC architecture, another idea that has subsequently been copied onto the Old Clunker (as Apple calls the IBM PC) itself by clone artists.

But while hypertext did see its first commercial implementation on the Apple architecture, it is really the work of a British academic and was initially brought to the market not by Apple, but by a small Scottish company that had revenues of under \$2 million last year.

Very few companies can claim to have created a new software category, and many inventors of new software are lost in the mists of time, but Office Workstations, Ltd., of Edinburgh (known in the United States as OWL

International of Bellevue, Washington) can justifiably claim to be an innovator, having beaten Apple to hypertext on the Mac by a full year with its product, called Guide.

The man who laid the groundwork for hypertext was Professor Peter Brown of Kent University. Hypertext is simply the principle of using a single word, placed anywhere in a normal text document, as the key to another piece of text elsewhere on a system. It's as if a secret passageway out of the back of one word leads into a longer explanation of the word, or to another statement linked to the word.

Hypertext can be thought of as the text equivalent of a cell on a 3-D spreadsheet: a single figure in the cell may be the end result of a different spreadsheet of calculations. To reach that spreadsheet, just put your mouse cursor on the cell and click, and the screen drops you into another dimension of figures.

With hypertext, if you see a key word that you need to know more about, you simply click on it, and suddenly the screen is flooded with text that replaces the key word.

Imagine a mechanic trying to fix an automobile with his manual onscreen in hypertext. As it comes to the part about the "inner wheel bracket pad housing assembly," the mechanic places the cursor on the expression and clicks the mouse. Immediately, extra copy comes up onscreen,

explaining the expression and telling him the part number, the price, and that he should order it from Warehouse C5/88. He clicks on C5/88, and up comes the postal address, the telephone number, the hours the foreman works, and the fact that this warehouse stipulates ordering procedure A9. He then clicks

**News flash from  
Silicon Glen:  
hypertext is now  
high on the list of  
Scotland's exports.**

on A9 and is led to another piece of text, and so on.

All these pieces of information are held together in a single file, but if you were to read the file from top to bottom, you'd never see any of this explanatory text—it exists underneath the key words. An author of hypertext must plan in advance how many hierarchical levels he intends to build into the document.

In the United States, the Ford Motor Company thought so much of this idea that it implemented a similar application, the Service Bay Diagnostic System, based on Guide. Renault, in Europe, has followed the example more closely, keeping maintenance schedules and manuals on its award-winning Sitere system, which holds all after-sales service documentation on a CD-ROM system for Renault dealers.

OWL developed Guide in both Macintosh and PC versions, but its emphasis from the start was on the Mac product. The Mac version was introduced first, in September 1986, and carried a price tag of \$135; the PC version was launched almost a year later, in July 1987, and sold for \$200. By mid-1987, with more than a year's sales behind it, OWL began to think of itself as one of



ILLUSTRATION BY PAUL SCHULENBURG



# EUROTECH

the rising stars of the PC software industry.

Then Apple introduced HyperCard.

OWL developed Guide in close cooperation with Apple, and there is little doubt that Apple knew how its launch of HyperCard would affect the fledgling software house. In fact, OWL staffers still wince when reminded of the sudden introduction of HyperCard, especially Apple's bundling of the product with the Macintosh as a no-cost extra. Even now, more than a year later, it still rankles them that OWL was given no warning of the launch so that they would be able to prepare a strategy to distinguish Guide from HyperCard. On that score, OWL has been playing catch-up ever since.

OWL argues that HyperCard doesn't use hypertext, but a similar idea in which a one-word tag can be attached to a piece of unstructured text and used to group that text with other related texts. The thinking behind HyperCard comes more from the organization of index cards, each of which carries only a small amount of information, rather

than the manual-size amount of megabytes that Guide handles.

Phil Cooke, product development manager for OWL, contends that HyperCard "isn't very good at handling large amounts of text, although you can do clever things with the graphics. HyperCard uses more of a notecard style of presentation, a bit like a sales card, and you navigate via cards rather than via buttons in the text. Guide is for data measured in megabytes, and we even have a management method in a piece of software called IDEX, which we've just launched in the United States, which allows you to comfortably deal with amounts of text data measured in gigabytes."

Despite the differences, the sudden interest in HyperCard significantly hurt sales of Guide. OWL was forced to shift its emphasis to the PC version and, when making sales calls, refrained from mentioning its own Mac product, for fear that its largest customers might be diverted to HyperCard.

In September 1987, OWL decided to drop the Mac version but quietly resur-

rected it after much internal debate. In the United States, where sales of Guide have been concentrated, OWL has worked hard to differentiate Guide from HyperCard. The company found that customers who would have never thought of using Guide had played with HyperCard and found the concept interesting. Virtually every major account customer they approached had already thought about using HyperCard, and some already had simple applications running under it.

Now OWL is enjoying increased U.S. sales of the Mac version of Guide, picking up on customers who have been attracted by the attention that Apple has drummed up for the concept, or those who have had a taste of hypertext via HyperCard and want to do more.

In the end, the market's interest in HyperCard has made Guide easier to sell, and OWL's resentment toward Apple is beginning to fade. ■

*Peter White is with APT Data Services in London, publisher of the ComputerGram International news service.*

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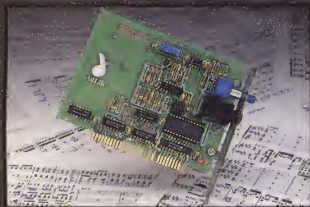
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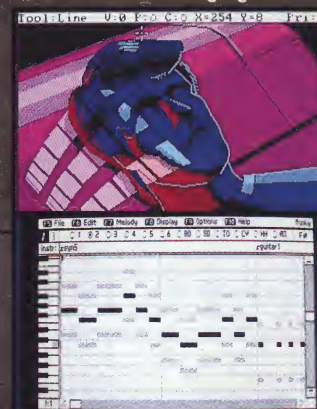
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*Space Quest III from Sierra (top) and Ad Lib Visual Composer/MIDI Supplement (above).*

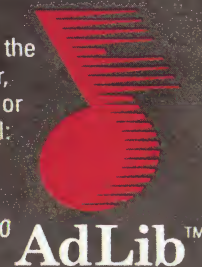
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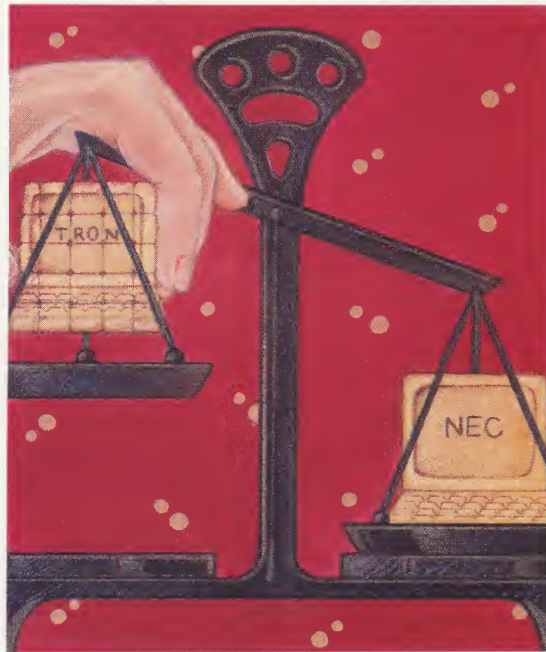
By RICHARD A. SPRAGUE

**W**hy have Japanese companies, which already rule the U.S. consumer electronics world, failed to capture the American PC market? No doubt because competition in Japan's domestic market—a condition that has preceded every successful export campaign—has been suppressed by the dominance of a single company. Recent developments in Tokyo, however, threaten to increase the heat in the Japanese PC industry and create a situation that could have long-term implications for the United States as well.

American PC users take it for granted that there are two competing standards for desktop computers today. The major standard, represented by IBM and dozens of clone companies, still leaves room for a consistent, well-organized attack by the minor Macintosh standard being pushed exclusively by Apple Computer.

The Japanese market shows no such tolerance. At least 50 percent of all PCs installed in Japan are made by NEC, and the company's dominance extends to every niche in the industry: high-end and low-end business computers, home computers, laptops. This has continued since 1977, when NEC became one of the first companies in the world to offer a working PC, the TK80, which was later exported to the United States. The rest of the Japanese PC market is split among a dozen other makers.

Ken Sakamura, a computer science professor at Tokyo University, uses the VCR market as an example of how other companies could break NEC's hold on the Japanese PC business. The Sony Corporation, he notes, pioneered the videocassette recorder industry with a high-quality recording method called the Beta format. Soon after Beta's in-



troduction, Sony captured nearly all of the market, leaving its competitors far behind. In a desperate attempt to gain some share of this lucrative business, the rest of the industry united behind a single standard called VHS. The resulting market push of these manufacturers working in unison was enough to unseat Beta when the small VCR industry turned big.

Sakamura is developing a computer architecture that may do the same thing in the Japanese PC market. His idea centers on a family of computers called TRON, which stands for The Real-time Operating system Nucleus. By last summer, more than a hundred major Japanese companies had signed up to support the TRON standard. These companies include Fujitsu, Hitachi, Toshiba, IBM Japan, and even NEC itself, which last year decided it could no longer afford to stay out of the action.

The most talked-about member of the TRON family is called BTRON, a computer that is similar to the Macintosh, with high-quality bit-mapped col-

or graphics, a built-in pointing device, and an easy-to-use, hypertext-based user interface.

But the scale of TRON's top-down, system-based approach to hardware design offers major advantages over the Macintosh. For example, the Macintosh was developed for an off-the-shelf microprocessor, but TRON's designers started by assuming a virtual machine that allows TRON to run on any microprocessor. This allowed them to develop a computer that can efficiently use Japanese and other nonalphabetic character sets, a critical feature in an industry whose growth has been stifled by a language that is difficult to accommodate on Western-style computers. This ap-

proach should also ensure a market for TRON in Asian and Middle Eastern countries that don't yet have a domestic computer standard.

TRON's virtual machine also has the advantage of a clean architecture not burdened by the need for compatibility with existing standards, which has been a problem for software developers

**TRON could break  
NEC's hold on the  
Japanese PC industry.  
Get set for the  
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working on other processors, who must worry about "real" and "protected" modes. In addition, common bit-mapping instructions are supported directly in the microprocessor, adding more speed to the user interface.

What's more, all TRON specifications have been placed in the public do-



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main, and any TRON-supporting company can make compatible hardware without having to pay a licensing fee or worry about look-and-feel lawsuits. Now that they have equal access to a market that was formerly restricted by the NEC standard, several Japanese companies are manufacturing very large scale integration (VLSI) TRON microprocessors. These are very fast 32-bit chips (upwardly compatible with a future 64-bit TRON design), and there's fierce competition to make them run even faster, since performance is the only differentiating factor among the competing machines.

As if that weren't enough to make TRON a serious challenger, the Japanese Ministry of Education has decided on a timetable for the introduction of computers into Japanese schools, a potential market of roughly 1.6 million machines for the schools alone, plus countless other purchases from parents who will buy home models for their kids. The ministry ruled earlier this year that those computers must have TRON specifications, a seal of approval that could open a market estimated at up to 10 million TRON computers as early as 1992. With this large volume, Sakamura hopes that TRON machines will sell in the price range of color TV sets, with everything from budget-size models to full-blown units aimed at power-hungry users.

But TRON isn't just a new type of PC. If it were, its chances for success in America would be limited by the overwhelming market momentum of IBM and Apple, not to mention new heavyweight competition from Sun Microsystems and other workstation manufacturers. Rather, TRON is a family of compatible machines that spans a range of computer applications.

The TRON family members are called BTRON, ITRON, CTRON, and MTRON. BTRON (the "B" stands for business) is an operating system for single users. ITRON is a modification of the basic TRON operating system that makes it more useful for industrial and embedded applications for controlling robots, intelligent assembly lines, and the like. CTRON is a set of protocols for use by central file servers in wide area networks or on large computers. MTRON is the macro environment network that ties these different computers together.

Sakamura's dream is to make computers in all these TRON groups, and because the operating systems will be



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compatible, it will be easy to link them together. A BTRON user will be able, for example, to download a phone number that is stored on an ITRON-standard wristwatch, then dial the number using an MTRON telephone.

The adoption of one of these TRON groups (some of which don't have standards yet) will make it easier to promote the others. Japanese companies that support the standard in consumer products bearing their well-known brand names will be in a good position to push BTRON machines as well.

But even with these obvious advantages for Japanese consumer electronics companies, there might be early opportunities for American hardware and software manufacturers who pay serious attention to TRON now. Because all TRON specifications are in the public domain, American companies are free to adopt the TRON standard.

In fact, supporting TRON is probably the best approach for an American company that wishes to export computers to Japan. Since the TRON standard enables computers to work well with the Japanese language, a foreign company can simply use TRON specifications to convert its existing hardware into a true Japanese computer. U.S. companies such as Apple and Atari, which already make millions of graphics-oriented machines, could use their current manufacturing volume as a base from which to compete against Japanese companies that are just starting to climb the learning curve.

The technical advantages of TRON over the NEC standard are obvious, but the problem for the Japanese marketplace is similar to the one faced by Apple in the early days of the Macintosh: how to encourage the development of innovative software and hardware additions that will give consumers an incentive to switch from their old machines. It won't be easy to unseat NEC's well-entrenched standard—certainly not in the short run.

Export models are still further in the future. Even if TRON is wildly successful in Japan, its influence might not be felt here until well into the 1990s. But the coming fireworks should certainly make the Japanese PC industry more interesting to watch. ▣

*Richard A. Sprague has worked as a software engineer in Tokyo for NEC Aerospace Systems. He currently lives in Palo Alto, California, and consults on issues related to the Japanese PC market.*



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# MEDIA

By NORA GEORGAS

When Jim and Tammy Bakker said the devil got inside their computers and fiddled with the books, you probably thought it was a pretty original excuse. Maybe you even gave the Bakkers points for trying. And then you laughed.

But you probably didn't know that computers are *instruments of the devil*, unless you've been reading the nation's tabloids—not just gossip-mongers like the *National Enquirer* and the *Sun*, but hard-boiled papers like *The New York Daily News* and *The New York Post*.

Aliens from space, unexplained mysteries, apparitions, evil incarnate, computers: take your pick. In the tabloid press, they're interchangeable.

## America's Youth Threatened

Consider, for example, this story from central Florida, as reported in the *Sun*: "Teen Computer Buffs Trade Info on How to Kill Teachers," blares the headline. The terrifying tale concerns "the newest juvenile delinquents... more terrifying than ever. They're making the leather-jacketed thugs of the '50s and the long-haired radicals of the '60s look like wimps."

Who exactly are these hardened criminals? Read on...

"Pimpily-faced outcasts" are using computer bulletin boards to pass around "bomb formulas, telling how to blow up mailboxes, houses, and people," warns the paper.

"Posting bomb formulas on electronic bulletin boards is a great danger because so far there's nothing illegal about

it. Many of the bombs, although made with simple household products, can be extremely hazardous. . . . Sometimes, computer gang war results and hackers end up planting bombs outside each other's homes."

And then comes the most chilling revelation of them all: "Teens read these horrifying messages with a computer and a modem that links comput-

card companies, charging thousands of dollars' worth of goods to someone they know, or by calling up a repossession company, posing as a bank, and having a car repossessed."

Is there hope for America's future?

## Male-Merge

In New York, the 'bloid dailies had a field day with the discovery of a "computerized" prostitution ring in the borough of Queens.

"High-Tech Sex Ring Busted," read the front-

**PCs: the work of the devil or just good copy?**  
**Inquiring minds want to know.**

page headline of the *Daily News* on April 6. The subtitle: "Queens hookers used beepers and computer."

Not to be outdone, *The New York Post* countered with the headline "Computer Hooker-Up."

The ring reportedly used a PC and a database to maintain the names and descriptions of the prostitutes and their specialties. Ring members then fed client names into the computer to make the best match

of client and hooker.

Meanwhile, up the road in Harlem, the PC Boys have been wreaking havoc. PC Boys sounds like the name of a user group, and it is—but not the kind that swaps pocket protectors and interrupt jokes. These dudes are a drug gang that has inspired headlines like "PC Boys: Gang's Blood Runs Cold."



ers by telephone lines. *Their parents have no idea what's going on.*"

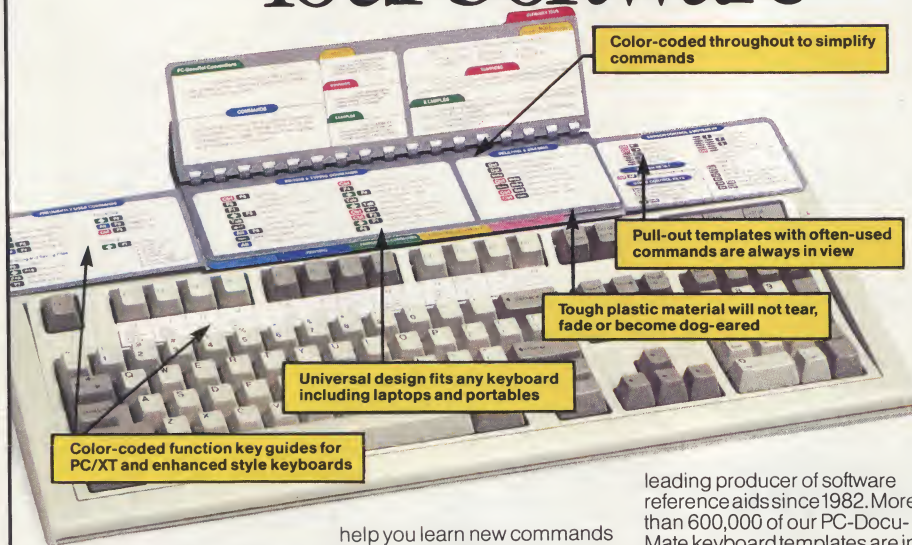
Not a pretty picture.

Computers have joined cars and rock music to turn the nation's youth against their elders. And computers can strike at even the most wholesome youngsters, says the *Sun*: "Even nonviolent teens can spread terror by hooking into credit



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## MEDIA

Change your name, guys: you're giving the computer nerds a bad rep.

## Computer Brains

Ready for some good news? A lady in India uses her "computer brain" to beat records—and Univacs. Her name is Shankuntala Devi, she hails from beautiful Bangalore, and she can multiply two 13-digit numbers correctly in "a staggering 28 seconds."

From her humble beginnings as a circus worker's daughter whose reputation as a "living computer" spread throughout her native country, Mrs. Devi rose to challenge nothing less than a Univac 1108—and won. The duel took place in 1977, and it earned her a place in the *Guinness Book of World Records* in 1981.

But Mrs. Devi remains impervious to the mysteries of computers. She says, "If I can feel human beings are still superior to computers, it gives me tremendous satisfaction." You said it, Shankuntala.

## Intense Productivity Experts

A roundup of trivia in a September edition of the *Weekly World News* carried an alarming item. Next to a T-shirt ad that pictured a bust of Elvis and included the pitch "Wear the King on your chest!" the *News* informed us that "experts say bosses will one day use computers to analyze the brain waves of employees to make sure they're keeping their minds on work!"

That's just, as the *News* announces, "a sample of the mind-blowing trivia" the paper's editors have run across "while scouring the globe for stories."

## IBM's Secret Ingredient

By now you're probably clicking your tongue at the gullibility of the lowbrow readers of the lowbrow press. Well, hold on to your monocle, because here's proof that no one is immune to the mysterious powers of personal computers—not even *The Wall Street Journal*.

A recent edition of the *Journal* carried a front-page story about IBM's new Micro Channel PS/2 machines. The provocative headline "Mystery Machine" topped a second headline about people "bewildered" by IBM's "secret ingredient."

Fess up. You believe Elvis was a computer, don't you? A prehistoric computer from space. ■

Nora Georgas is editor of PC/Computing and a subscriber to the *Weekly World News*.



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naturally over time. The *DOConfig* program lets you arrange the layout of your disk for best overall performance. And the *Analyze* program gives you a graphical look at the condition of your disk, so you'll always know when it's time to optimize again.

## A total of 17 different programs.

Disk Optimizer includes *Findfile* for locating files by name or wildcard anywhere on your disk. *Sorts* for re-arranging files and directories in the way that makes sense to you. *Lock* and *Unlock* for password-protected file security. *Killfile* for erasing sensitive data permanently. And lots more.

In all, there are 17 different programs in the new Disk Optimizer. Each one designed to improve performance, guard your data, and make disk management easier and simpler for everyone.

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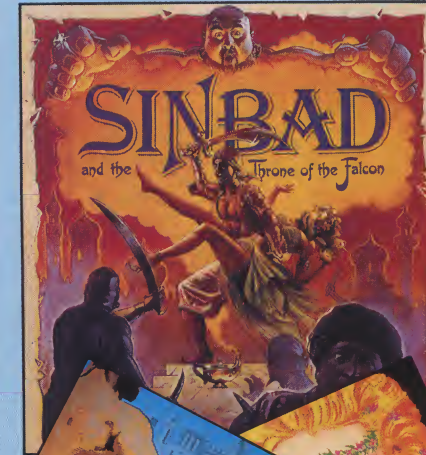
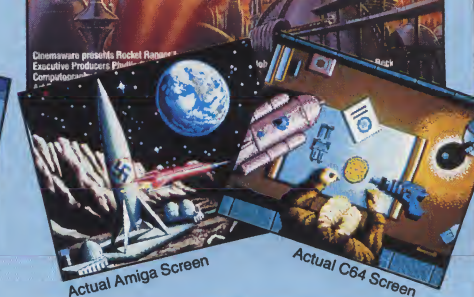
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# IMPACT

By PATTI HARTIGAN

**I**t's a rainy Sunday afternoon, and you're at a museum looking at 20th-century paintings with a new friend. You know that she's pretty serious about art, and so far you've kept your mouth shut, for fear of committing an unpardonable faux pas.

She stops in front of a painting by René Magritte and ponders it for a moment, obviously waiting for your reaction. As the silence grows, you can tell that she's starting to wonder whether the outing with you was a mistake. What do you do?

You excuse yourself, race off to a nearby computer terminal, and type in Magritte's name. Up comes a biographical sketch of the painter, a critical review of his work, and high-resolution images of his paintings.

You hurry back to your companion's side. "This is obviously one of the man's lesser works," you say. "The themes he's touched on are much better developed in *Delusions of Grandeur*, which, by the way, used to hang in the Alexander Iolas Gallery in New York." Your date is impressed.

Ah, sweet success . . . and you owe it all to the museum's newly installed image database management system.

This scenario may someday be a reality. Researchers in the Advanced Technology and Planning Group at the University of California, Berkeley, are developing a system for the University Art Museum that could change the way museums operate and the way visitors view exhibits. Dubbed the University of California-Berkeley Image Data Base, the prototype system combines the latest in image processing and database management technology, and it's one example of how museums of all types—from art to science to children's museums—are turning to PC technology to improve exhibits and expand services.

When Berkeley's system is fully in

place, students and museum personnel will not only have a wealth of information at their fingertips but also be able to save time on tasks that they used to do manually. The Image Data Base, which runs on a Sun Microsystems



workstation and includes Mac IIs and IBM PS/2s, lets users call up images and text, enlarge images, zoom in on sections of them, and even change their colors, contrast, and brightness. If a work has been scratched or otherwise damaged, restorers can use the system to create a slide of how it looked originally. Art historians can examine details and brush strokes, pinpointing minutiae not visible to the naked eye. Curators can design exhibits right on the screen.

And what of those endless condition reports that must be filed every time a work of art is lent out or moved? Normally, when a piece returns to a museum, restorers must spend painstaking hours examining it and reporting on any damage. "Condition reports are done by hand, which can take two hours to a full day, with someone sitting there with pen and paper, describing 'nick, 3 centimeters long, 8 centimeters from top, 25 centimeters from right,'" explains Howard Besser, image database specialist in the Advanced Tech-

nology and Planning Group. The new system makes the process easy: a digitized photograph of the returned work is overlaid on the previous image, and the system pinpoints the tiny differences between the two.

The Berkeley project grew out of the need for bibliographic control: in the past, each item in the university's art collection was cataloged on a typewritten index card. Berkeley's system answers a common problem: museums across the country have been grappling with how to computerize their files, a task more difficult than automating a traditional office. Museum collections, after all, elude standards. "We have miles and miles of cases of bats, butterflies, and dinosaur bones," says Larry O'Reilly, assistant director for exhibits at the Museum of Natural

History at the Smithsonian Institution in Washington, D.C. "How do you classify one object out of millions? Where do you start?" he asks.

Besides documenting collections for internal use, museum directors are putting PCs to work for educational uses. At the Smithsonian, for example, researchers developed a program called

## PCs are becoming as integral a part of museums as dinosaur bones and paintings.

"How to Become a Fossil," which was installed in the Museum of Natural History's Discovery Room last December. The program, which runs on an IBM PC, includes a lesson plan on fossilization and a "Wheel of Fortune"-style game in which users try to determine whether an organism will become a fossil. "The idea was to bring the ob-



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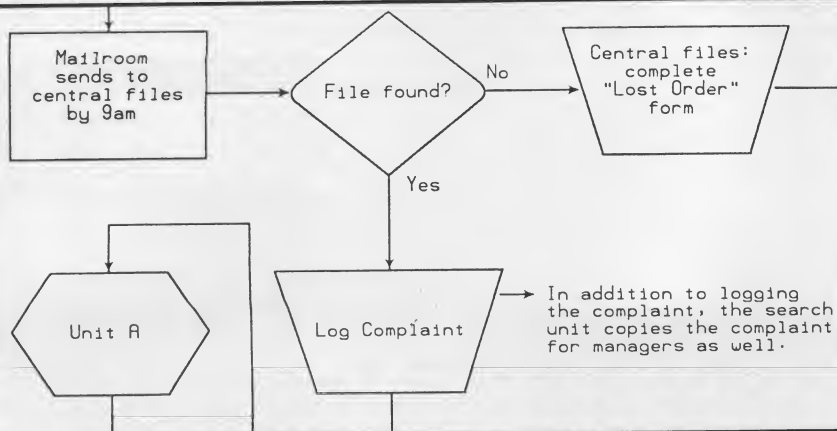
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## IMPACT

jects to life," says Anna Behrensmeyer, a research curator at the museum.

Such tools enliven the museum visitor's experience. A health exhibit at the Boston Children's Museum includes telephones hooked up to DECTalk, a voice synthesizer. Young visitors use the phones to hear further information about the exhibit. And this is just the beginning: the museum recently received a grant from the Digital Equipment Corporation to explore expanding the role of computers at the institution.

More PC products are being developed with museums in mind. PictureWare, Inc., of Bala-Cynwyd, Pennsylvania, offers PicturePower, an image database system. The New York-based Campus Computer Corporation recently introduced an art database system. And the Cognetics Corporation is marketing Hyperties, a hypertext program developed at the University of Maryland's Human/Computer Interaction Laboratory.

Hyperties was incorporated in "King Herod's Dream," an exhibit put together by the Smithsonian's Traveling Exhibition Group. In the exhibit, Hyperties gives users information about how to find and join archaeological digs. Ken Holum, a history professor at the University of Maryland and co-curator of the exhibit, says: "It was a wonderful way to let viewers apply what they'd learned. It's fun; it's exciting; it's intellectually challenging. This is the wave of the future."

Ben Shneiderman, head of the Human/Computer Interaction Lab and developer of Hyperties, echoes his colleague's enthusiasm. He foresees supplementing the cards normally used to identify museum exhibits with miniature touch-screen computers programmed with a wealth of information about each object. He explains: "Let's say you're looking at an object, and the card says something like, 'Ibo culture, donated by so and so, found in Nigeria.' You can touch 'Ibo culture' on the screen for more information. You just keep touching; let your fingers do the walking. This allows the museum curator to offer a wide variety of information and the visitor to pursue his own interest as far as he wants."

Nonstop information. That's what museums are all about.

But what are the social implications of computerized exhibits? Will the gadgetry detract from interest in the art itself? And with high-resolution images and data available on a system like the



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W <-- SELECT MODULE OR FUNCTION																													
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P - ACCOUNTS PAYABLE																													
R - ACCOUNTS PAYABLE																													
W - PAYROLL CHECKWRITER																													
		D - CHANGE DATE																											
		X - MONTH END PROCESS																											
		* - EXIT TO DOS																											
? <-- SELECT YOUR OPERATION																													
** PAYROLL **																													
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		NEXT CK NO: 1615																											
		TAX TABLE: 88-CALIF																											

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## IMPACT

one being developed at Berkeley, why bother going to a museum at all? Why should we stand among crowds at a museum when we can view the same images—perhaps with better resolution—at our terminals?

Ironically, it's Howard Besser, developer of the Berkeley system, who is raising these questions. "When images are available on a network, the idea of a museum will be drastically altered," he suggests. "On the one hand, more people will have access to the artwork. But on the other hand, people will see a two-dimensional version of the real object. There's a real danger they'll start thinking it's the real thing, which debases the original."

The Berkeley system makes it possible to clean up copies of damaged artwork and photographs onscreen, and Besser worries that the new images will replace the originals, the way colorized movies threaten to replace the original black-and-white versions. One solution would be to keep the system in-house for use by curators and researchers. But what's the point of hiding such a valuable tool from art lovers and the public?

Besser wonders whether museums will go the route of the glorious movie palaces of Hollywood's Golden Age, which have been replaced by small-screen multiplexes. "Sometimes I feel like Dr. Frankenstein," Besser admits. "I have real concerns about what's going to happen—not strong enough to kill the system, but I do have a social responsibility to raise the questions."

Likewise, the Smithsonian's Larry O'Reilly worries that curators will get caught up in computermania and lose sight of a museum's goals. He warns, "When using a computer in an exhibit, you have to ask the same questions you'd ask while designing the exhibit itself. What are we trying to communicate? What's the computer there to do? If you don't put a great deal of thought into it, the computer's just a gizmo rather than an effective tool."

Ben Shneiderman plays down his colleagues' caution. "A museum is a wonderful institution," he says, "a physical place to see art in a community of people." Computers will never change that, he believes, but will enrich the museum experience. "The technology will empower people. They'll use it to fulfill their own dreams." ■

*Patti Hartigan is a Boston-based freelance writer who covers theater for The Boston Globe.*

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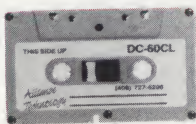


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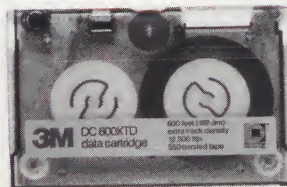
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# NEXT

By FREDRIC PAUL

**S**ince the dawn of civilization in Mesopotamia, people have had computing devices they could carry in their hands. Dr. Gwen Bell, founding president of the Boston Computer Museum and curator of the "Computers in Your Pocket" exhibit, says the first shepherds carried stones to help keep track of their sheep. Back in the 1600s, Napier's Bones, tiny contraptions built of bones and rods, made multiplication tables portable.

Computers have yet to join this venerable tradition. Even though today's laptop PCs—some weighing as little as 4 pounds—are vastly smaller than the room-sized behemoths of the early days of computing, they still don't come close to fitting in your pocket.

Of course, there are computers smaller than laptops. The most powerful are descendants of the handheld data-entry devices, often connected to bar code scanners, that were first used to perform store inventories in the 1970s. Companies such as National Datacomputer in Billerica, Massachusetts, and Micro Palm Computers in Clearwater, Florida, are making data-entry computers that run DOS and Lotus 1-2-3-compatible spreadsheets. Fancy electronic diaries and executive calendars from giant Japanese manufacturers are also moving toward becoming full-fledged computers, and handheld calculators are gaining processing muscle. Experts predict that before long you'll be able to hold in your hand 80 to 90 percent of the power of a desktop PC.

But it's not yet time to trade in your big machine. The problem with smaller computers isn't processing power: even an 80386 chip would fit comfortably into a handheld package. The real problems with miniaturization are input, output, and battery power.

**Let's get small: new technology will shoehorn the power of a PC into a package you can hold in your hand.**

Getting information into a handheld computer is perhaps the biggest problem. Bar code scanners and numeric keyboards are fine for limited applications, but they can't match the flexi-

bility of a full Qwerty keyboard.

"Technology has the answer for everything but the keyboard," says Robert Lucky, executive director of communication sciences research for AT&T Bell Laboratories. "Typing is the only decent way [to enter data] for a long time,

and the ergonomics really dictate a full-size keyboard. I want someone to develop a folding keypad, but the mechanics of that have been a hang-up."

Some theorists cite pointing devices such as mice as a way to get around the keyboard problem for many applications. Bob Doyle, chairman of IXO, Inc., of Manhattan Beach, California, whose Telecomputer helped pioneer the handheld concept, likes the idea of building an entire computer into a mouse and rolling it over anything handy.

Another space-saving proposal under investigation is to use a touch-screen to make the surface of a handheld computer do double duty as both keyboard and display. Each application would configure different areas of the touch-screen for display or for input as needed.

Voice recognition may present the best hope of eventually solving the handheld input problem. "For people," says Lucky, "talking is the best way to



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## NEXT

exchange information." Unfortunately, computers still have a hard time understanding speech. As the complexity of the communication increases, says Lucky, "the speed of communication goes way down and the frustration level goes way up."

Estimates of how long it will take for truly fluent voice recognition systems to arrive on handheld computers vary from 5 years to more than 20.

Once the technological barriers of speech recognition are overcome, psychological difficulties will have to be conquered. Doyle, who helped design the ground-breaking Merlin handheld computer game, says human factors

**Today's top-of-the-line laptops are already bumping up against the limits of battery technology.**

made voice technology a resounding failure for games. It would be simple and cheap, he contends, to build a system to distinguish between a spoken "yes" and a spoken "no," yet no one is doing it. As makers of cars and appliances have already learned, says Doyle, "people are not yet ready to talk to machines, or machines are not yet ready to listen to people. Buttons are what we like to do."

Although data input is the thorniest problem, handheld computer developers are also stuck when it comes to output. Most handhelds sport tiny screens, useless for displaying anything more complex than a phone number.

Samuel Wiegand, chairman and CEO of the GRiD Systems Corporation of Mountain View, California, which is noted for its excellent laptop displays, acknowledges that small size and light weight are critical in the field but adds, "People want big screens."

To get both at once, manufacturers are considering using lasers to project screen images onto walls or other suitable surfaces. Some experts talk about 3-D holographic projection as an option that would allow images to be projected in space, eliminating the need for an external surface.

Rather than get big, Reflection Technology's approach to the display problem is to get small. The Cambridge, Massachusetts, company has developed a tiny screen that, when held close to



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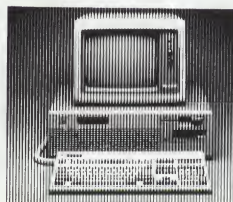
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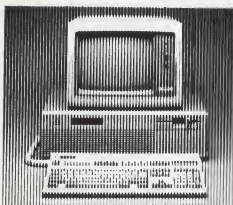
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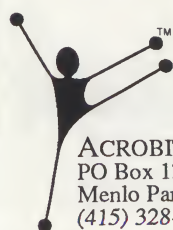


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Neil Golden, marketing manager for Reflection Technology, says the company has licensed the system to several manufacturers but won't describe how it works or name the licensees. Golden expects the first commercial versions to hit the market within a year, at prices as low as \$100 each in quantity.

No matter how handheld computers

**Book-size computers  
would be small enough  
to carry but large  
enough for a useful  
keyboard and display.**

evolve, they're almost certain to require more power in smaller packages. New screens and high processing speeds will gobble electricity, and current battery technology just isn't up to the task. Even today's larger and heavier top-of-the-line laptops are bumping up against the limits of battery technology. For many handheld-computer companies, "batteries are one of the biggest headaches they've got," acknowledges Richard McNeight, executive vice president of Paravant Computer Systems in Melbourne, Florida.

All makers of small portable electronic devices face the same power crunch, so there is a big research push into new battery technologies, as well as lightweight paper- and plastic-electrolyte power sources. Jim Palmer, at Micro Palm, sees potential for rechargeable lithium batteries.

One way to maximize the handheld PC's strengths, while making an end run around its problems, might be to chop computers into modules. Bruce Stephen, a senior PC analyst at the International Data Corporation in Framingham, Massachusetts, envisions the handheld PC as a portable engine powering a number of different computers—at home, in the office, and in the field. It would possess some limited functionality on its own, but its prime duty would be to act as a controller for other systems. The controller could be unplugged and used as a handheld PC on its own for limited applications,

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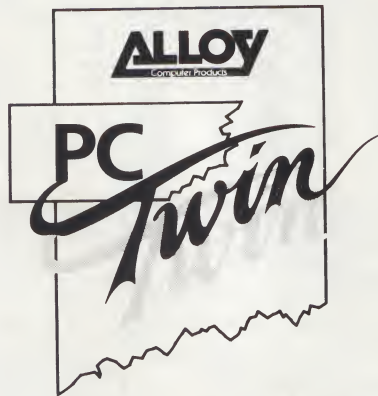
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## NEXT

hooked up to a keyboard and a screen to create a full-scale laptop, or plugged into a desktop computer, supplying processing power and tapping into home automation systems and local area networks.

Despite the progress in miniaturizing PCs, many people question just how small computers should get. Harvey Allison, an analyst for Wertheim Schroder, a brokerage house in New York, is "extremely skeptical of the demand for a desktop computer in a shirt pocket." He believes that the natural limit for miniaturization is the notebook or laptop format. "How small do you want a book?" he asks.

In fact, book size is a popular reference point: small enough to carry but large enough to include a useful keyboard and a decent display. Frederic LaPointe, product line manager for handheld computers at Panasonic, says, "People want something that weighs 1 to 2 pounds, fits in a briefcase, and runs existing software."

A notebook-size computer would also make an excellent delivery system for electronic books, finally making it possible to "curl up with a good computer." Users could plug in disks or cartridges containing the text and graphics of the books they want to read. As more and more internal storage became possible, such computers could contain more and more information, until they became real-life versions of the title device from Douglas Adams's novel *The Hitchhiker's Guide to the Galaxy*.

Some question whether there is an overwhelming need for any kind of small computer. "Who would use it?" wonders IDC's Stephen. "A lot of people work in stationary environments," he points out, "and don't need a handheld." But Micro Palm's Palmer sees the emergence of handheld PCs creating new markets. "The availability of the technology will draw out applications," he predicts.

"People have always had a handheld or pocket-sized tool to enhance their memory and processing capability," adds Gwen Bell of the Boston Computer Museum. "This will continue. We will get as much as we can in our pocket. This is a trend that started in Mesopotamia, and one just doesn't see it ending." ■

*Fredric Paul is a senior editor of PC/Computing. He's moved twice in the past year and has had it with full-size PCs.*

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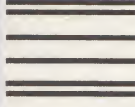
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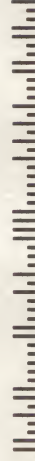
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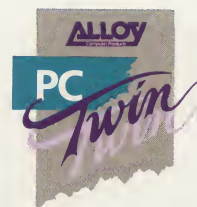


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# LEARN

By PHIL SCOTT

**I**t's a Federal Aviation Administration requirement: before a pilot can receive his license, he must prove his aeronautical knowledge on a written, multiple-choice examination. And "the written," as it's called, is one tough test.

Pilots not only earn licenses but can also earn several different ratings—private pilot rating, instrument rating, commercial rating, and so on—and a progressively harder written exam stands in the way of each one. In every case, the questions come directly from a 900-question volume issued by the FAA specifically for the individual rating.

Prospective pilots can prepare for the writtens in many ways, from attending collegelike ground schools to studying videotapes. For my private certificate, I enrolled in a three-night "accelerated" course at my local airport. My instructor's method was to read every question and its correct answer from the FAA question book; the students marked the answers in their copies. In my case, the result was a score of 76 percent, a mere 6 points above a failing grade.

I took that test before the advent of PC-based ground schools.

PC software for would-be pilots is a recent innovation; the most successful programs have been on the market for less than two years. Two programs already stand out from the crowd: GroundSchool, which comes in versions for the private, instrument, and commercial writtens, and Private Pilot Written Test Simulator, available only for the private pilot exam.

## GroundSchool

When you boot RMS Technology's GroundSchool, a drawing of a business

jet glides across the monitor. But that's the extent of the graphics in the program; the rest is all business. Learning the program is easy—and that's a relief, since there is so much else to learn

in the learning session, a correct answer elicits cheerful musical tones, and a wrong answer earns a derisive buzz and an explanation. In this test mode, however, you can't get help until after you answer.

In the learning and test sessions, you can choose questions from the FAA question battery at random or select them by category. And the program can help you to identify your weak areas in several of the test-question categories, such as meteorology and federal aviation regulations.

The main menu also has an evaluation screen that lets you know your percentage of correct answers in each category. The program will even give an estimate of what your score would be if you were taking the real written exam.

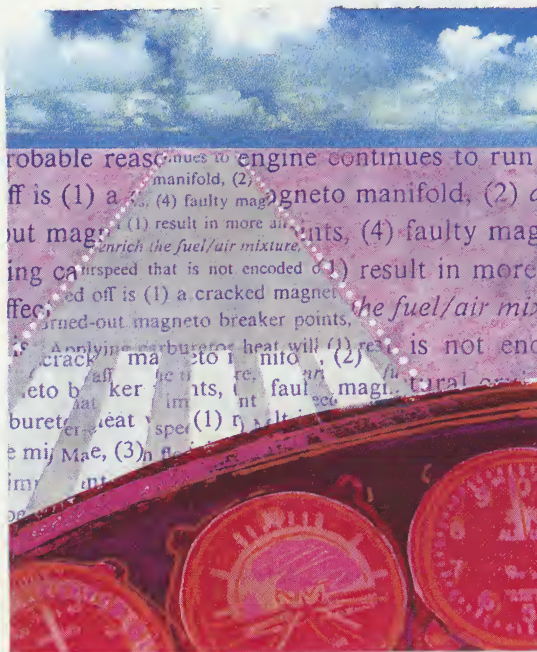
One final, and important, feature of GroundSchool: you can print out a "diploma" if your expected FAA exam score comes out to be 70 percent or higher. Federal regulations state that you must satisfactorily complete a ground-school or

home-study course for the certificate or rating you seek. The graduation certificate won't look good in a frame, but it will satisfy the FAA.

The only black mark on this other-

**To the fledgling pilot,  
the most traumatic  
part of learning to  
fly is ground school.**

wise excellent learning tool is its lack of graphics. More than two-thirds of the instruction manual consists of charts and figures that are referred to in the program. Given the graphics capabili-



when you're preparing to take the written exam.

You can choose several options from GroundSchool's main menu. The first is a learning session in which you practice with FAA questions from the program's database. If you aren't sure of an answer, pressing H produces helpful hints—but not the answer. If you choose a wrong answer, the program highlights the correct one, and pressing any key brings up an explanation and the title of the U.S. government reference work from which the question was derived.

The second main menu choice takes you to a test session that asks you questions and keeps track of your score. As





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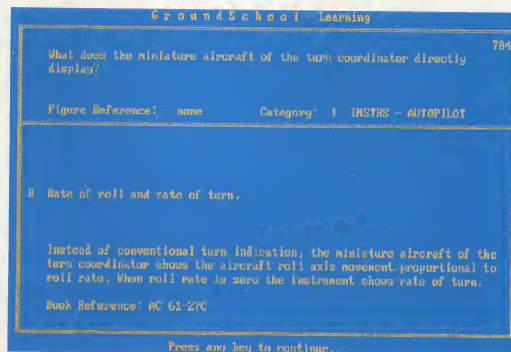
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# LEARN



**Top screen: Private Pilot Written Test Simulator's test mode refers to figures printed in the instruction manual. You have four hours to complete a 50-question test. Bottom screen: If you choose a wrong answer in GroundSchool's learning mode, the program emits a derisive buzz before highlighting the correct answer. Pressing any key gives you the explanation and refers to a U.S. government source book.**



ties of today's monitors, it's a mystery why RMS didn't include the required charts alongside the questions.

## Private Pilot Written Test Simulator

Dynacomp's Private Pilot Written Test Simulator gives you the choice of a test simulation or a practice session. To help you decide, an explanation of each function pops up in a description field at the bottom of your screen.

If you decide to practice, the program allows you to take questions in the order that the FAA stores them, to choose them by their FAA identification numbers, or to field questions chosen at random from any of eight subject areas, such as aerodynamics and navigational charts. Help is available at the touch of the F1 key.

Should you choose a test simulation, the program draws 50 questions from its database and gives you four hours to complete the test. After you finish and press the Esc key, the computer begins grading. From the test evaluation menu, you can bring up a screen that displays a bar graph with your most recent test results and a table showing your 15 most recent scores. The menu also lets you review your test so you can see the questions you missed.

Like GroundSchool, Private Pilot Written Test Simulator issues a diplo-

ma once you've earned a grade of at least 70 percent. And Private Pilot has onscreen graphics for all but a few navigational charts.

It's estimated that 30 to 40 percent of student pilots are computer literate, and that percentage is increasing rapidly. With an expanding market of computer-savvy students ready to earn their wings, GroundSchool and Private Pilot Written Test Simulator could be poised for takeoff. ■

*Phil Scott is managing editor of Flying magazine. If training software had been available when he took his pilot's test, he believes, he would have passed with flying colors instead of merely squeaking by.*

## GroundSchool

**List Price:** \$49.95

**Requires:** 256K RAM, DOS 2.1 or later.

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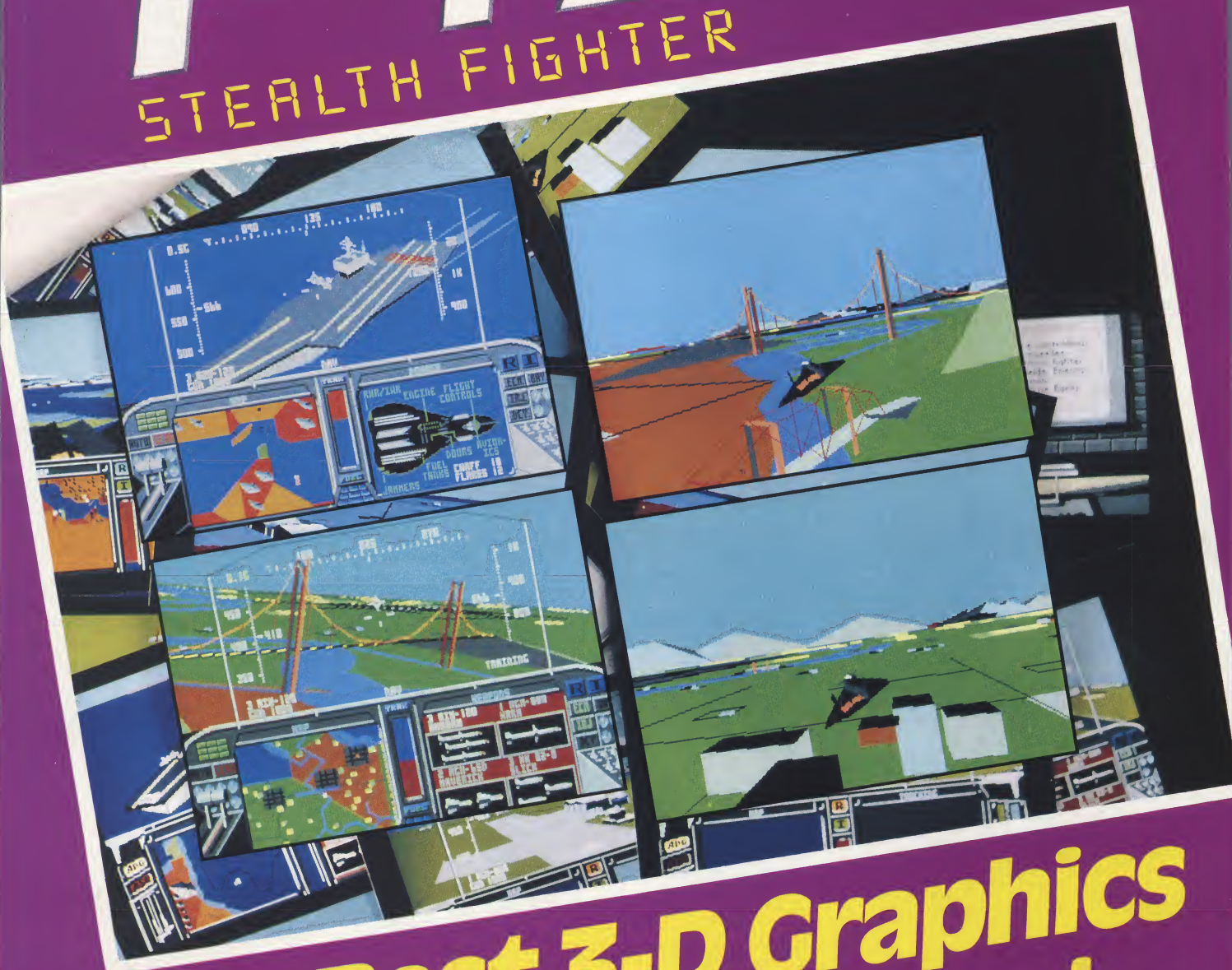
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# KIDS

Edited by HERB BRODY

**M**any of you are telling us with pride that you use computers for genuinely useful work—that PCs are not just expensive toys for playing the latest space games when your parents think you should be doing homework or practicing the piano.

There's nothing wrong with wanting to be productive. But remember that you are, after all, kids. You're supposed to play; that's your job. So don't feel you have to apologize for using a PC purely for enjoyment. And while we're talking about what's important and what's not—don't tell your parents this, but much of what grown-ups do with PCs doesn't exactly advance the progress of humanity.

So don't feel guilty about having fun. There will come a time when you might have to be sneaky—playing games on the sly while pretending that you're working on some project your boss says is important. Go ahead and be useful. Write stories, store recipes, produce graphical promotions. But don't abandon the fun of games.

Many of you will be getting new games and other nifty computer stuff for Christmas or Hanukkah. Check them out, then mouth off: write to us about what you think is great, what stinks, and what you wish someone would invent.

Ryan Petersen of Bowmanville, Ontario, is "appalled" that adults seem oblivious to his seriousness.

*The possibility of kids actually using a computer as a tool instead of just a game machine is often overlooked by adults.*

*I have been using an XT compatible for about a year now, and I've kept up pretty well with my knowledge of the newer PS/2s and the VGA graphics standard from reading PC Magazine and others. I re-*

*cently became excited by the idea of upgrading my display to a VGA, so I decided to look into buying a new monitor and card. Looking to impress salespeople, I studied up on model numbers, company names, and brand statistics before visiting a few of the computer dealers in my area.*

*It was amusing to watch the response I got after asking a question concerning something other than games. One sales clerk I spoke to even suggested that the rea-*



*son I was interested in upgrading was so that game graphics could be more appealing on a VGA display than my current CGA display. I was appalled. It is apparent to me that more adults should wake up and realize that it is possible for us kids to know just as much about computers and computer applications as an adult.*

Ryan Petersen, 14  
18 Saunders Ave.  
Bowmanville, Ont.  
Canada L1C 2A5

So you finally have your hands on a computer—but it's got this boring monochrome monitor, it's slow, and it runs out of memory when you so much as think about loading it up with a big program. And thinking about it is all you can do anyway, because you can't

afford all the great software you read about in magazines such as this one. Not to worry. Kevin Yiee has lots of ideas for turning your PC into a money machine. Kevin suggests using the computer as a "less laborious" way to raise cash than such traditional after-school jobs as mowing lawns, walking dogs, and washing cars.

*For starters, begin by typing your mom's recipes into your database. She will appreciate how orderly her recipes are, and she just might reward you with a raise in allowance.*

*If you know how to type (and if you don't, learn!), start a typing service. Ask your friends for reports, letters, and other documents that they want typed up. Tell them how neat and tidy their reports are going to look, and remind them that they will get higher grades for typed reports. Charge them what you think is fair. They will come back over and over again (at least until they buy computers).*

*Teach kids how to use a computer. Start by introducing them to the computer, then teach them how to boot disks, use software, and maybe do a little programming. Parents will be happy to pay the tuition, since they know their children are learning computer literacy and other skills that will be helpful in the future. Let your students demonstrate*

**Turn your PC into a money machine—  
or use it to toast  
the Big Cheese.**

*what they have learned, and their parents will be more than satisfied.*

*A fun activity that can bring you money during the holidays is printing customized greeting cards, calendars, and letter-*



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# KIDS

heads. These are extremely popular during Christmas and are easy to make. All you need is a printer that can print graphics and a print-shop type program. Next, ask neighbors and relatives for orders on these cards. Explain that they can have any printed message they desire. Make the cards easy to read, cute, and creative. If you can deliver the cards within one day, they might be impressed and give you a little more than your normal fee.

This is only the tip of the iceberg of the many ideas that can bring you some extra money with your computer. Just use your imagination and put your ideas to work.

Kevin Yiee, 14  
3169 Pampas Pl.  
Las Vegas, Nev. 89102

Ambition starts young in California. Third-grader Nicole Borromeo writes that she wants to have her own business when she grows up. She's starting already, using her computer.

I love computers. I sell banners using my Sesame Street Print Kit disk. I hope to make lots of cash for Christmas. Do you know kids who want their names in big letters? Big people also buy from me.

Nicole Borromeo, 8  
150 Cottonwood Cove Dr.  
Diamond Bar, Calif. 91765

Not that kids are losing interest in games. Some of you are even creating your own. Chris Grant of Willow Lake, South Dakota, has been trying for the past two years to program a space adventure game in BASIC. That effort has inspired the following story—which, Chris assures us, "did not come out of personal experience."

I was at my desk, typing away at the adventure game that I had been obsessed with for the past six months. The computer had been powered up the whole time because the program could not save my position; my mother even started making me pay my part of the electric bill. But I wasn't about to stop.

I walked down the dark, dank main corridor leading to the royal throne room. As I hugged the walls to help keep my balance, I noticed that both the floor and the walls were covered with a green, slimy moss. I walked through double doors into the huge royal room. The main doors and throne were covered with precious gems.

To my fright and surprise, the screen read, "You find: THE WIZARD OF YULDAAN."

I was now confronted with the most awesome endeavor ever attempted by a mere wizard's apprentice. I had finally made it to the Master Sorcerer, the Big Cheese, the creator of chaos, the man behind the mask, the maker of cheese balls, the head honcho himself, the Wizard of Yuldaan. The cursor pulsed on and off as I panicked at the keyboard. Finally, to protect myself from bodily injury, I decided to throw a spell. I quickly typed "shield spell" as the screen spread green light throughout the dimly lit bedroom. Next feat: get the Wizard of Yuldaan.

Frantically, I typed "lightning spell" and caught him totally off guard. He was hit! I hit him several more times, but it was not enough. He threw a fireball at me, but I ducked behind the table. I cast a sonic blast spell that startled him, giving me time to throw another lightning spell. This time I got him good with a mighty blow that left him lying on the floor in front of

**"Adults should wake up and realize that it is possible for kids to know as much about computers and computer applications as an adult."**

his throne, barely able to breathe—toasted cheese.

As I walked up to him I was thinking pretty highly of myself. I had actually beaten the maker of cheese balls! I was about to finish him off with a lightning bolt when suddenly the lights went out in my bedroom. I was startled at first, but then I realized that the power had gone out. "The computer!" I was watching the computer die!

The screen was now black, and the power light had gone out. My triumph was now lost. As my eyes adjusted to the darkness, I noticed a growing green glow reflected in the monitor—and a faint odor of cheese.

Chris Grant, 16  
P.O. Box 236  
Willow Lake, S.Dak. 57278

**Kids . . . this is your page in PC/Computing. Not just for you, but also by you. Send your submissions to Kids Department, PC/Computing Magazine, 80 Blanchard Rd., Burlington, Mass. 01803. If we publish your letter or article, we'll send you a check for \$25—so make sure you include your complete home address and your telephone number.**



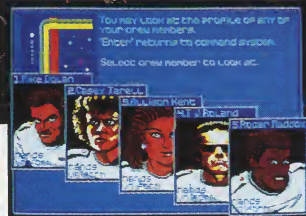
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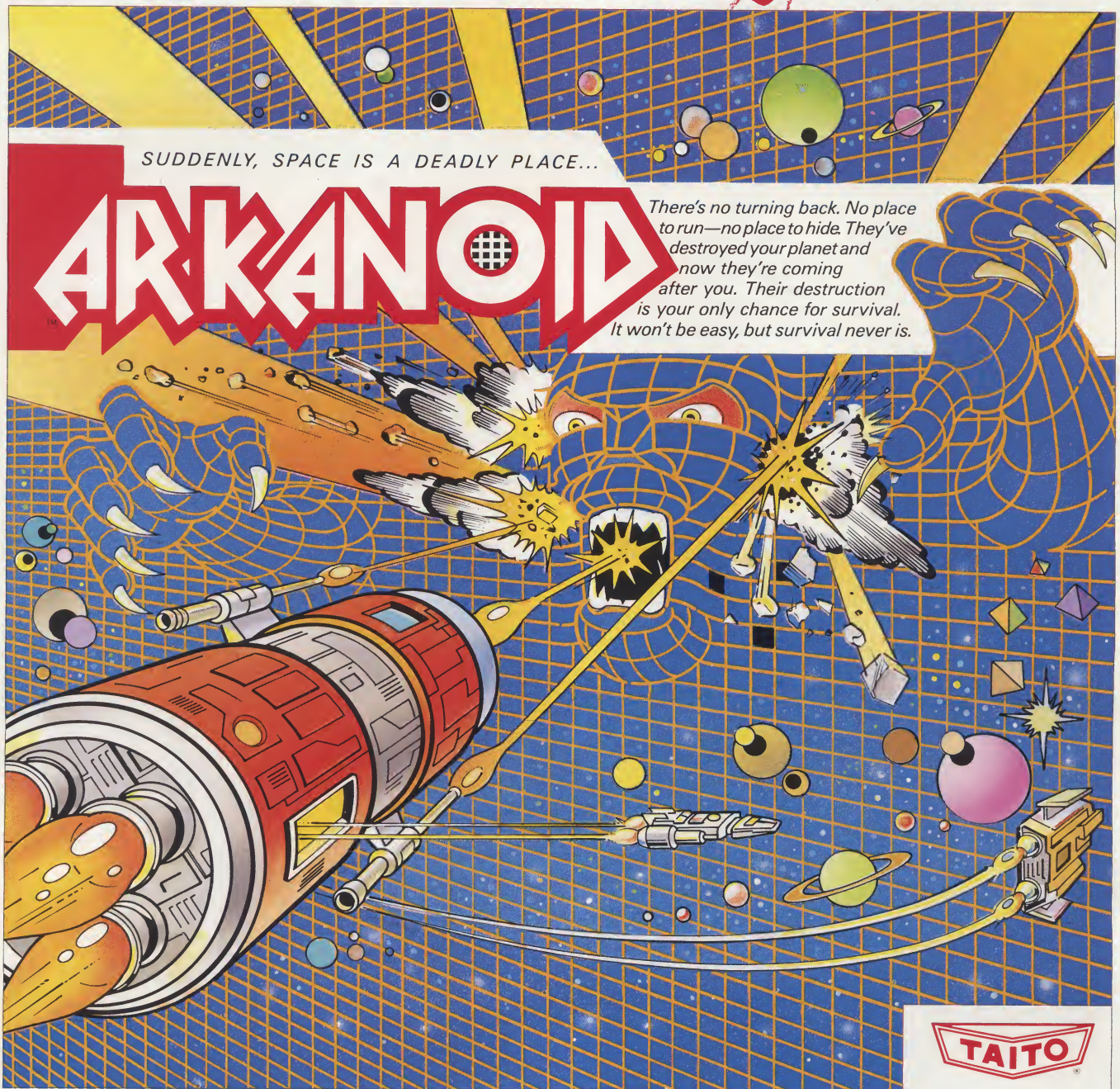


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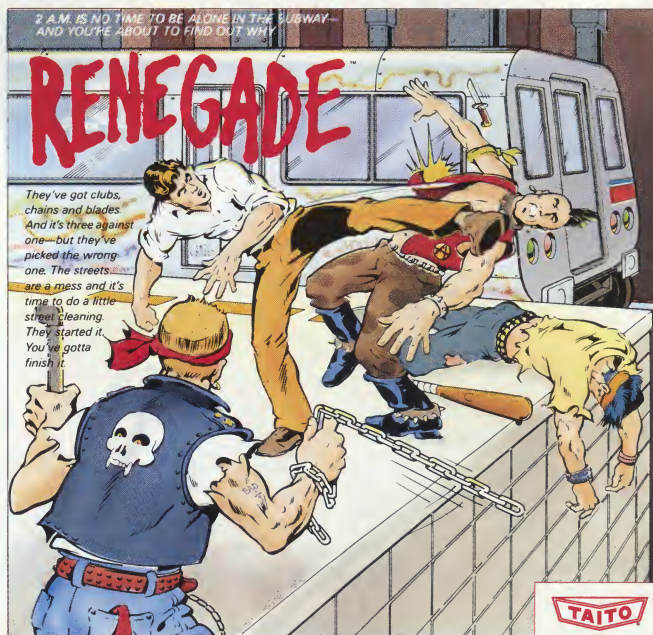
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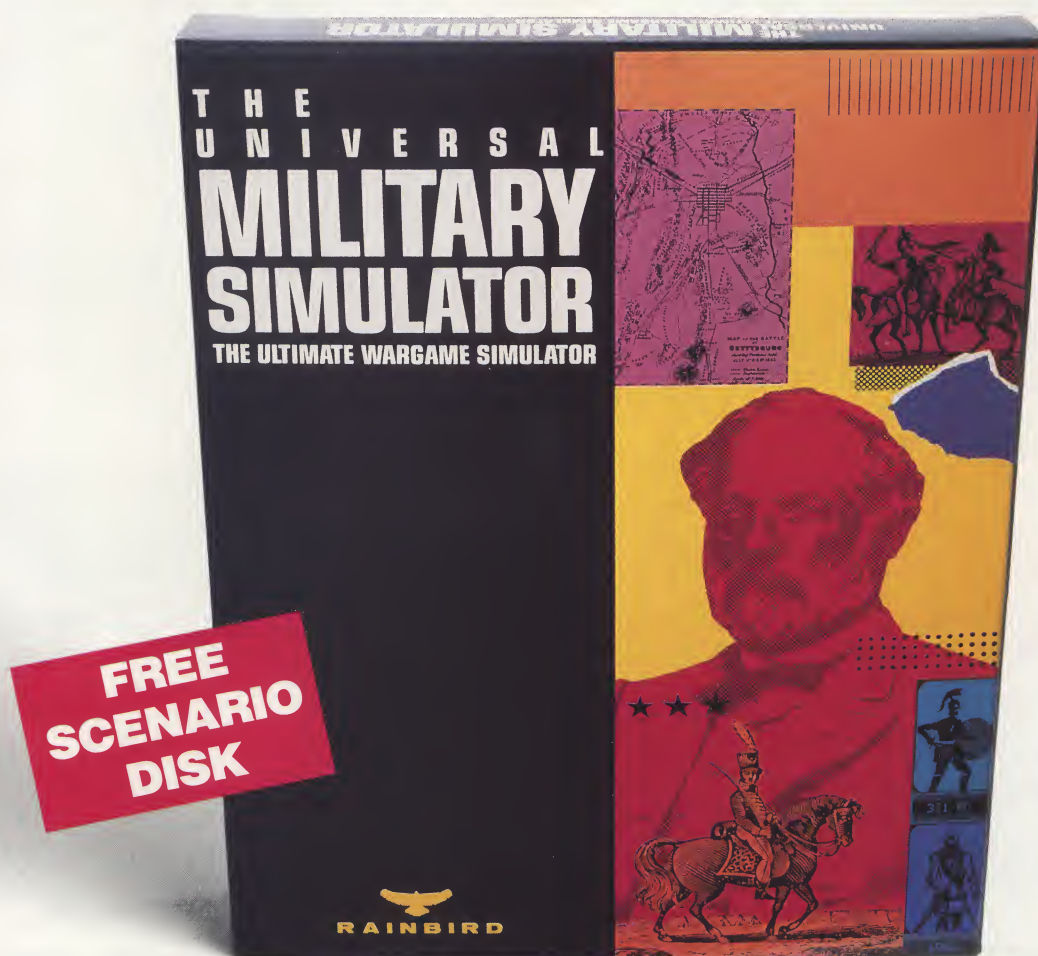


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# FUN!

By **CHRIS SHIPLEY** and **MARTY JEROME**

**T**he time: A.D. 2815. The place: the Nine Worlds, a colony consisting of Earth and eight planets on the edge of the galaxy, in a region known as the Galactic Fringe. We are all seekers, compelled by some greater mission, winging our way through an "interstellar, interactive, role-playing space opera."

This is *Star Saga: One—Beyond the Boundary*, and to call it a computer game seems somehow to trivialize it. *Star Saga* is software, charts, books, maps, and imagination.

The story begins some 300 years after the Great Expansion (the rampant exploration of stars and planets beyond the galaxy) came to a grinding halt. The Space Plague, an alien epidemic of unknown origin, devastated the human race and brought the Nine Worlds, and space exploration, to its knees. For protection, the colony established a border around itself, the Boundary. The Space Patrol enforces the Boundary's one law: anyone may leave, but no one may return.

The players in this opera are six castaways, compelled by dream, quest, or force to cross the Boundary. There's Laran Darkwatch, who seeks a holy relic that will reveal the Final Truth; Jean G. Clerc, in search of the technology to build the ultimate spaceship; Valentine Stewart, on one last galactic binge before taking the helm of the family's smuggling ring; Corin Stoneseeker, whose quest for the lost

Stone has spanned generations; M.J. Turner, a hotshot pilot who escapes court-martial by assuming duties outside the Boundary; and Professor Lee Dambroke, a Harvard xenobiologist in search of alien intelligence.

To embark on *Star Saga's* interstellar adventure, you must become one of these characters, assuming his personality and keeping his secret. Only you have access to the character book that details your new identity. Only you know the mission before you.

The character book leads you beyond the Boundary and on to your goal. Take your turn by consulting the Computer Game Master (CGM), the keeper of moves, accomplishments, and acquisi-

tions. The CGM (referred to with affection as the Chubby Gray Monitor) is a rather dull, noiseless, text-only guide that takes you through your turn. Plot moves, explore known planets, discover

**As one of *Star Saga's* castaways, you must cross the Boundary.**

new ones, meet and trade with other players, fight and conquer alien creatures. It's all pretty straightforward, and the CGM keeps you from straying too far afield. After each turn, the Game Master sends you to one or more of the 888 texts that describe what has happened to you as a result of your turn and helps you to plot your next move. These texts are the heart of *Star Saga*, and you actually spend more time with them than at the keyboard.

*Star Saga* is not a short-term distraction or a rainy afternoon's entertainment. It's a multimedia extravaganza that encourages you to become consumed by your character. To accept *Star Saga's* invitation is to embark on 60 hours of role playing in which you accept responsibility for your destiny beyond the Boundary.

Here's how we fared, as two of the characters:

## **M.J. Turner, Space Patrol Pilot**

M.J. Turner here, ace pilot. Best in the Space Patrol, I don't mind telling



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## FUN!

you. Too good for the yokels of the Nine Worlds. I mean, I do my job and intercept smugglers coming across the Boundary, and then I'm nearly court-martialed—barratry, they called it.

I was acting captain of the *New New Haven*, and while I did alter the ship's course against orders, I also caught more smugglers in a week than we'd caught since I'd come aboard.

So there I am behind bars on Enduar, when Admiral Roland Wilkins pays me a visit and cuts me a deal: the Patrol drops its charges, and I get a ship, cargo, and an assignment—outside the Boundary. Read that "exile." But it had to be better than ten years in the brig and a lifetime grounded.

I christened my ship the *Barratry*, loaded the cargo bays, and took off across the Boundary. First to Para-Para to meet up with the big-bellied Dr. Schottky, then on to Medsun, Crater, and a handful of planets I discovered during my journey, all the while looking for some obscure pirate who's been beating up on cargo ships.

It's not a bad life, I guess. At least I'm flying, and I get to meet a lot of interesting beings. But I went to the Space Patrol Academy looking for adventure, and, aside from a few alien run-ins, I haven't found it. I spend too much time careening around dark galaxies, running Schottky's vague missions. Landing here, trading commodities there, hoping to have who-knows-what on board when it comes time to satisfy some sudden need.

It just hasn't turned out to be the excitement I'd hoped for. I don't really have enough control over my course, and I end up wading through mountains of printed words. Correct me if I'm mistaken, but this is the

Electronic Age, is it not?

And sometimes, when I turn the *Barratry* over to computer control, I wonder if I should have stayed in the Nine Worlds and tried to beat the court-martial rap.

I think so.

—Chris Shipley

### Professor Lee Dambroke, Dean of Xenobiology

Let me say first that my life has been rather a disappointment. Sequestered in the comforts of a professorship at Harvard University on the planet Harvard,

### Little did I understand how much worse is the ennui of space adventure.

I long ago grew bored with my work, feeling stultified with having to confine my research in xenobiology to the Nine Worlds.

Little did I understand how much worse is the ennui of space adventure.

At the time, I postulated that certain alien intelligences might possess powers that appear magical to humans, just as our mental powers would seem to them. If so, we could learn a lot from one another.

I lobbied for funding to research this theory, realizing that I would be turned down, since it would require me to travel past the Boundary of the Nine Worlds.

But under abrupt and suspicious auspices, I was given the spaceship *The Black Abyss* and a reasonably large cargo of goods for barter. I was told that I must return with at least three alien

"magical" abilities if I hoped to publish my findings. I would





[ [ LUCASFILM ON THE ART AND SCIENCE OF ENTERTAINMENT. ] ]

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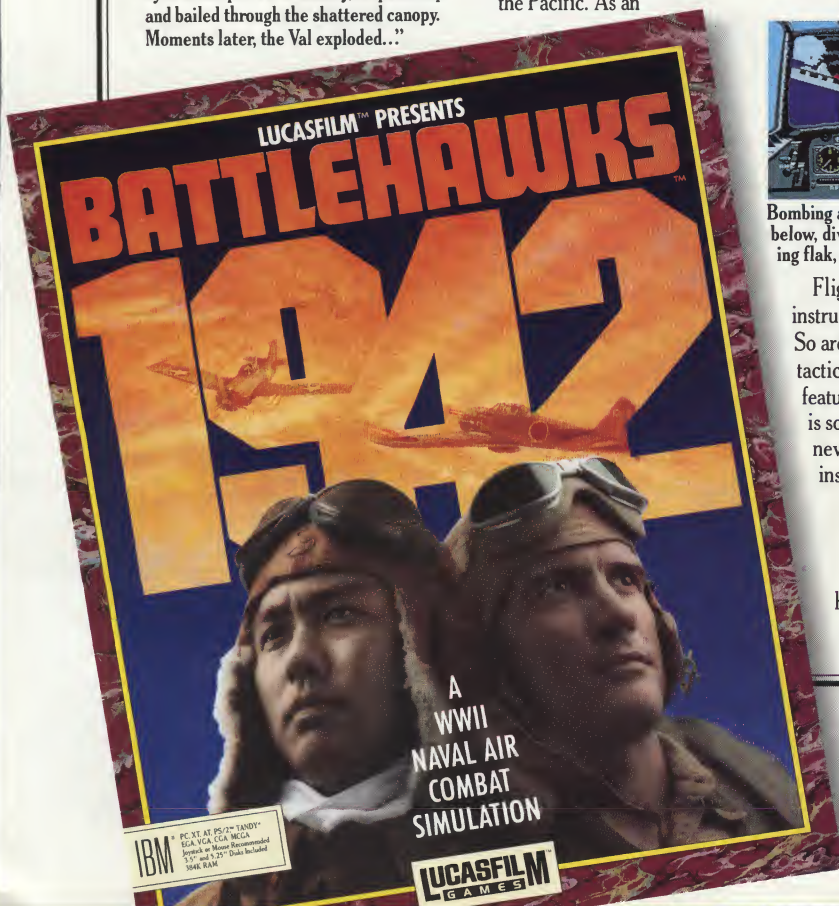
The technical detail and historical depth of *Battlehawks 1942* are bound to satisfy the most hard-core simulation buffs. Everything has been exhaustively researched, right down to the optimum airspeed and attack angle for dropping torpedoes.

"In early 1942, American planes were no match for my Zero. I was a hawk in a flock of geese — soaring, looping, pouncing, destroying. I was truly saddened for the brave men in those sluggish planes. All too soon, the planes got better..."

*1942* feel like the real thing. To a man, they said make it intense.

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"My first burst of tracers skimmed the Val's tail. Just as I corrected my aim, he dove. I stuck like glue to his plane, taking it apart by bits and pieces. Suddenly, he pulled up and bailed through the shattered canopy. Moments later, the Val exploded..."



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graphics, we use high-resolution, digitally-rendered images. Ships and planes look almost photographic. Bombs and torpedoes explode in infernos of flames and smoke. The feeling, as one veteran pilot put it, is like flying into a beehive.

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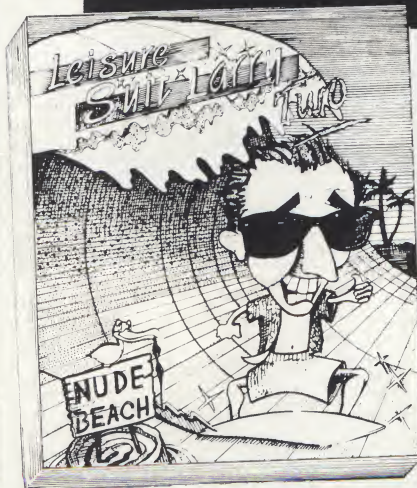
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But wait! Behind this beach blanket of fun and frivolity lies a ballyhoo of espionage and intrigue. With KGB agents, the Hairy Krishnas, and dozens of "available" women on his tail, Larry's good fortune could vanish quicker than his hairline!!

Dance, party, and chase the Babes — that's Larry's motto!! But with all the swinging times you'll have, *Leisure Suit Larry II* is also a very challenging adventure game that will test your street smarts to the fullest. Larry is not exactly the most polished Playboy around. After all, who else but Larry would wear tennis shoes with his polyester suit, cut his hair so short that you see his "whitewalls", or tell the girls that his new colored contacts are the "real thing" — let's all help Larry!

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## FUN!

also have to reenter the Nine Worlds without being detected by the Space Patrol.

With all these demands pressing on my mind, I set out on my expedition in a welter of confusion.

My first stop was Moiran, a dingy, rust-belt planet pervaded by the noxious odor of sulfur. I visited the local commodity market—an altogether sleazy affair—and made an inconsequential transaction there.

I then departed for Wellmet, another orbiting industrial wasteland. A rest stop at the local tavern turned up an unsavory character who inexplicably gave me one of the best star maps in the universe.

Hustlers, swindlers, drunks—I encountered lots of riffraff. I don't speak from moral repugnance so much as from boredom. And throughout my quest, I was sidetracked by nagging technical problems and ridiculous misfortune. Admittedly, there was the occasional pleasing diversion (one voluptuous alien comes to mind). Still, I felt frustrated: trivial forces so confounded my goals that my time was too often wasted.

The marvel of my adventures, however, lay in their diversity. My experiences brought a pleasant break from the single-minded demands of academia. I learned that not only my research but my very survival depended on how I plotted my course, how I learned to trade with untrustworthy beings, how I defended myself, and whether I could get others to give me the information I needed.

The best adventures work on many levels, of course. But they often require more than merely a good imagination. Overall, I found that my patience and tenacity were sorely tried, and that I longed to reach a conclusion rather than endure the tedious saga.

To use the vernacular: I got bored hanging out in space. —Marty Jerome

*Chris Shipley is a senior editor of PC/Computing. Marty Jerome is an associate editor of PC/Computing.* ■

### Star Saga: One— Beyond the Boundary

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Requires: 256KB RAM for PC version; also runs on Apple II and Apple II GS computers.

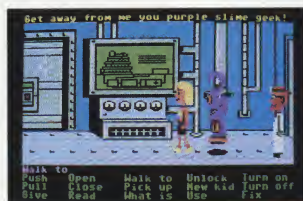
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**"T**HERE'S A LOT I LIKE about computer adventures, but it sure isn't fun getting killed all the time. That's why *Maniac Mansion* is so refreshing — I can play from start to finish without dying once!"

That's more than great fan mail. It's a very astute observation. Because while most story games treat



In *Maniac Mansion*, a movie-style "cut-scene" quickly establishes the characters' personalities.



Just three "clicks," and you'll send Zak McKracken over to the pawn shop counter to buy a pair of nose glasses.

interface, in most cases, remained in the swamp.

With conventional story games, whenever you want your character to do something, you type. And type. And type.

Suppose you want to pick up a green leafy object. Well, you might try typing, "pick up plant." If that doesn't work, you might try "bush," "shrub," "tree," and so on. After a while, you might try a different form of entertainment.

Not with Lucasfilm's new "point 'n' click" interface, though. All the words you need are right on the screen. Just click the cursor on them to choose characters, objects, and actions.

Now you can play an entire fifty hour game without typing a single word. Or putting your life on hold until you realize the green leafy thing is a...plastic fern.

## MORE STORY. LESS GORY.

Most story game designers seem to think people love to get clobbered.

We don't. After all, how much fun can it be to have a fatal accident every three and a half minutes... then reload your saved game, take a few timid steps forward, and save it again. Seems more like paranoia than entertainment.

That's why Lucasfilm story games make it downright difficult to die. Oh,

you'll get into major hot water all right, but you'll have the fun of getting out of it, too.

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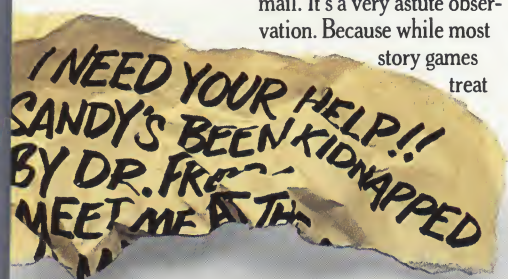
Or *Zak McKracken And The Alien Mindbenders*, where you and a seedy tabloid journalist save the world from space aliens who want us all to have the IQs of turnips.

You'll love the twisty plots and the goofy characters. You'll crack up constantly with the zany one-liners and sight gags. And you'll go just a little crazy with the mind-bending puzzles.

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you like the meat in the dog food factory, Lucasfilm story games treat you like a human being who just wants some good clean fun.

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# CONNECT

By DAVID DEJEAN

**A** look around the office of almost any sizable business will confirm that computing problems are becoming less local. The analysts running their big Lotus 1-2-3 spreadsheets share files among themselves on the local area network, but they can't get to the data on the company's mainframes. The managers increasingly depend on the LAN's electronic mail system, but their support staff can't use it: the terminals on the secretaries' desks are dumb devices that talk only to a central word processing system. The roomful of clerks in accounting could help break the data-entry bottleneck in customer service—if their mainframe terminals could talk to customer service's computer.

LANs have been brought into companies as solutions to very specific, very local problems. And they haven't had a lot more muscle than what they needed to get those jobs done.

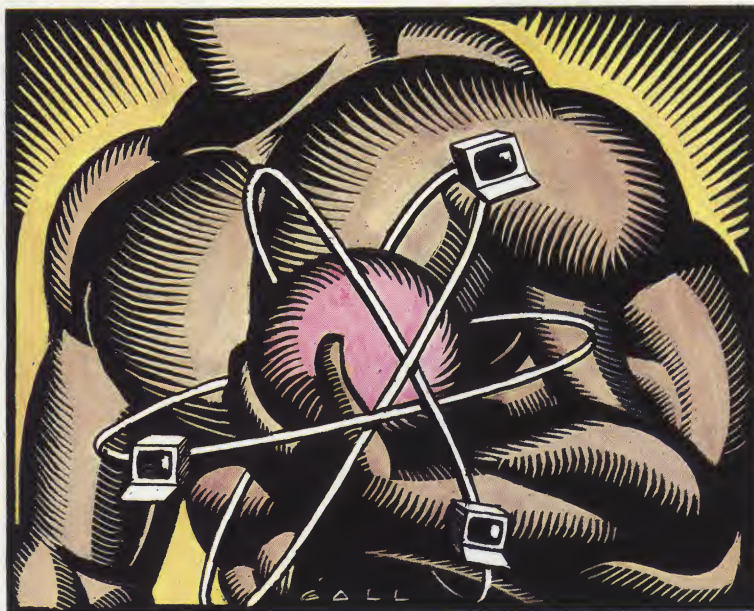
The servers on networks—the machines dedicated to handling users' requests for files, or printing, or communications to computers outside the LANs—started out like the 98-pound weakling PCs they served. Like weight lifters in training, they developed muscle fast; the 386, for example, has been a natural for duty as a network server. But PC iron can be pumped up only so far, and the greatest test of its strength is its usefulness as a particular sort of network server—a gateway server, a computer on a network that manages communications between a company's LAN and an external data source,

which can be either another computer or another network.

It's not that the communications problems are so difficult. An IBM PC AT, beefed up with the right add-in card and software, could act as a gateway that would solve each of the problems described above. But a single AT doesn't offer enough processing muscle to handle the mix of a large company's communications problems. It's two mixes, really—of terminal devices and of communications needs.

A company's accounting terminals might be 3270s, IBM's ubiquitous dumb terminals, while its customer service department might use VT-100s to connect to a Digital VAX minicomputer. The support staff might have Wangs. And the managers might use PCs and Macintoshes, with a few CAD/CAM workstations here and there for good measure. In such a mixed computing environment, hooking each type of device to something else can require a separate server.

Conversely, a department could be populated entirely by identical PCs on a



LAN but require several gateway servers to communicate with the rest of the company: one to let PCs emulate 3270 terminals to connect to an IBM mainframe, another to connect to a VAX, another to handle high-speed wide-area network connections to computers even farther away, another to provide access to shared modems, another to tie into a separate network. A network with more servers than users

sounds like a joke, but it's not something micro managers laugh about.

Obviously, it takes more than weight training to get tough enough to deal

**When your network needs extra muscle, pump it up with one of the new breed of gateway servers.**

with the data communications needs of mixed environments. It takes genetic engineering.

A new gateway server from the Harris Corporation of Melbourne, Florida, is an early example of the coming breed. The SuperNet Super Gateway uses a fast 80386 processor (16MHz for the Model 20, or 20MHz for the Model 30) and runs on a network—but that's about all it has in common with the other PCs on the beach. Using the Super Gateway to crank out an interoffice memo in WordStar would be like rolling up a



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## Thank You.



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## CONNECT

howitzer to blow away a housefly.

The Super Gateway has communications muscles where you didn't think PCs could have muscles. It can attach to either a Token Ring or an Ethernet LAN—or to both at once. It can support dumb ASCII terminals, 3270 terminals, and dial-up terminals over modems. It runs the Unix operating system and will run DOS software such as spreadsheets or electronic mail packages under Unix, so that dumb terminals can perform some of the functions of PCs on a LAN.

**The Super Gateway's two models cost \$14,000 and \$20,000. There are cheaper ways to do every single one of these things—but we don't need to do single things, we need to do all of them.**

The Harris machine will connect with remote synchronous and asynchronous devices—meaning IBM mainframes and wide-area network equipment running at very high speeds to communicate with mainframes even farther away—and with Ethernet links to Digital VAXes.

It gets much more technical than that, of course; Harris didn't become one of the largest makers of IBM-compatible equipment by sending in a coupon from a matchbook cover. The company's press releases include more than enough technobabble to gladden the heart of any MIS vice president—Net-View support, SNA RJE, TCP/IP TELNET. But the bottom line is tremendous connectivity: systems talking to one another that couldn't communicate before.

An example: Your work for the Atlas Corporation occasionally requires you to do analyses and projections that depend on data from the company's IBM mainframes and the VAX departmental processor that somehow sneaked into marketing when Atlas bought Hercules International. The VAX holds all the Hercules customer warranty records. You have a PC on your desk, just like everybody else in the marketing support group, and you're all connected via coaxial cable to a network file server and a laser printer.

Last year, to do your analyses, you had to get user accounts on the mainframes and the VAX, run the reports you needed, and get them printed out (which meant a day's wait: when the MIS department says 24-hour service on print jobs, it means 24 hours and not

a minute less). Then you found the couple of hundred records you needed in each report and retyped them into 1-2-3 on your PC.

This year is different. With 1-2-3 running on your PC, you hit a key combination that starts the memory-resident server communications software and logs into the Harris gateway controller. You instruct the server to open a 3270 terminal session that connects you to the IBM mainframe. When the server has logged you into the mainframe, you bring up the reports you need and

find the records you want. You cut them from your screen onto the server's clipboard, then paste them into the Lotus worksheet templates you built a year ago. Same thing for the marketing department's VAX. Back out of everything, do what you need to do in 1-2-3, and your graphs are rolling out of the laser printer in about the same amount of time it took you last year to negotiate for a password on the VAX.

We're not talking fantasyland here. For one thing, the Super Gateway has a very real price tag: \$14,000 for the Model 20, a robust \$20,000 for the Model 30. It's true that there are cheaper ways to do every single thing we did in the Atlas example. But we didn't need to do single things. We needed to do them all.

The Super Gateway is one of the first of what will undoubtedly become a flood of do-it-all servers aimed at IBM's new 3174 cluster controller, a do-some-of-it device for connecting 3270s to mainframes. The 3174 will emulate a VT-100, but it won't do cut-and-paste. It will connect to a Token Ring network, but not to an Ethernet. Some jobs will still require standalone servers.

And cheap and simple though the solutions may be when taken one at a time, the problems seldom come one at a time. That's been a big problem with connectivity: gateway servers have been towers of Babel. At last they're beginning to become towers of strength. ■

David DeJean is a senior editor of PC/Computing.



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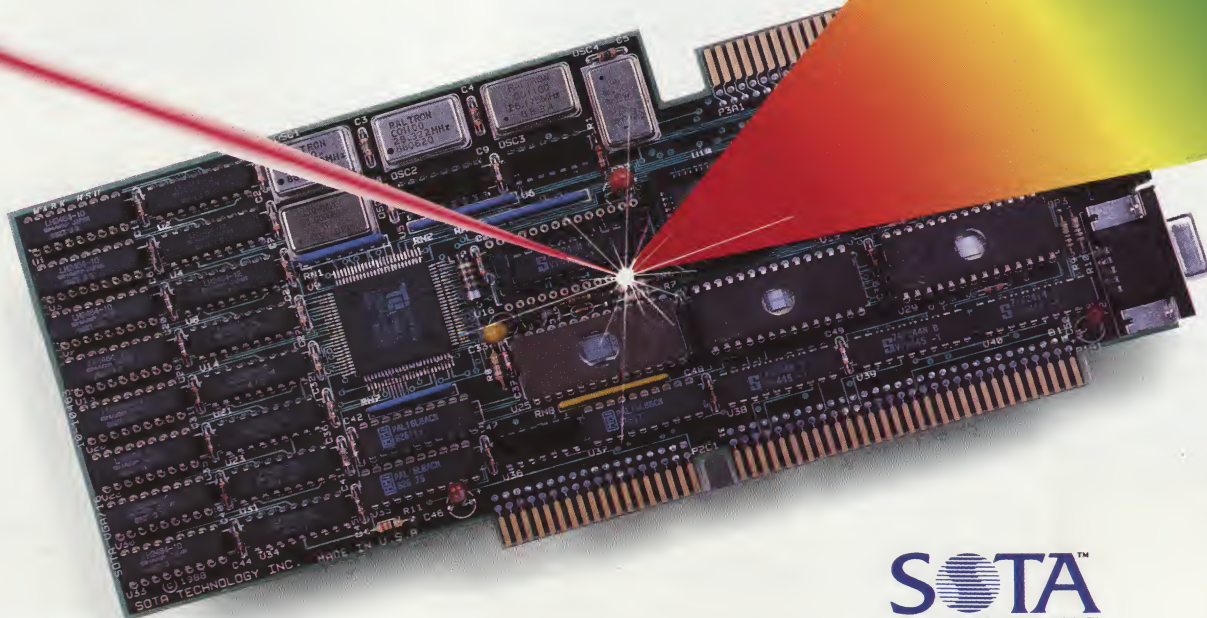
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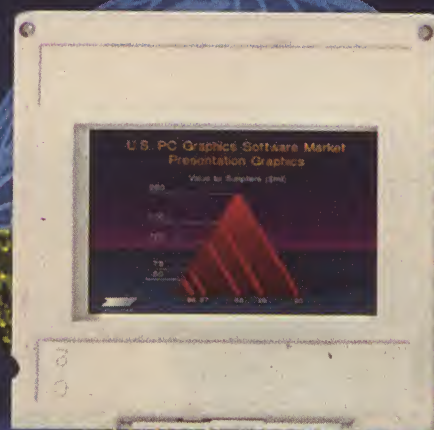
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# DOS

By PAUL SOMERSON

**I**t's easy to tell yourself you'll back things up completely tomorrow. Then something goes wrong. Nothing makes a user get religion faster than a hard disk that's starting to make sound effects straight out of a Rambo movie.

Backing up your programs and data files each day is a time-consuming process. It's something we'd all prefer to avoid. Last month in this column we

to study the structure of your hard disk and then use the MD or Mkdir command to re-create each subdirectory.

You can copy every file in every subdirectory on your C: disk to a backup floppy by typing

```
XCOPY C:\ A: /S
```

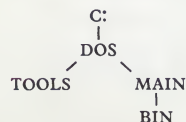
Xcopy reads the C:\ to mean C:\\*.\* and copies all files except special "hidden" ones. If you want to, you can copy only certain files, such as your .txt files, by using wildcards and file extension names. In the .txt example, you would change the command to

```
XCOPY C:\*.TXT A: /S
```

Let's say your hard disk contains four subdirectories:

```
C:\DOS
C:\DOS\MAIN
C:\DOS\MAIN\BIN
C:\DOS\TOOLS
```

A map of your disk would look like this:



To copy just the files in your C:\DOS\

MAIN and C:\DOS\MAIN\BIN subdirectories, issue the command

```
XCOPY C:\DOS\MAIN A: /S
```

In this case, Xcopy starts copying files in the C:\DOS\MAIN subdirectory. When it finishes, it jumps to the C:\DOS\MAIN\BIN subdirectory one level lower and continues the process. If you already have \DOS\MAIN and \DOS\MAIN\BIN subdirectory entries on the floppy in

drive A:, Xcopy copies the appropriate files from drive C: into them. If these subdirectories do not exist on drive A:, Xcopy /S first creates the subdirectories and then copies the files into them.

By changing the command to

```
XCOPY C:\DOS A: /S
```

you can have Xcopy churn through all four subdirectories in the example above. And by modifying the command to simply

```
XCOPY C:\ A: /S
```

you can have it throw in everything from the root directory as well.

Used alone, Xcopy /S will not copy subdirectories that contain no files, so if you want to maintain the directory

**Xcopy is great for those down-and-dirty jobs you would rather forget.**

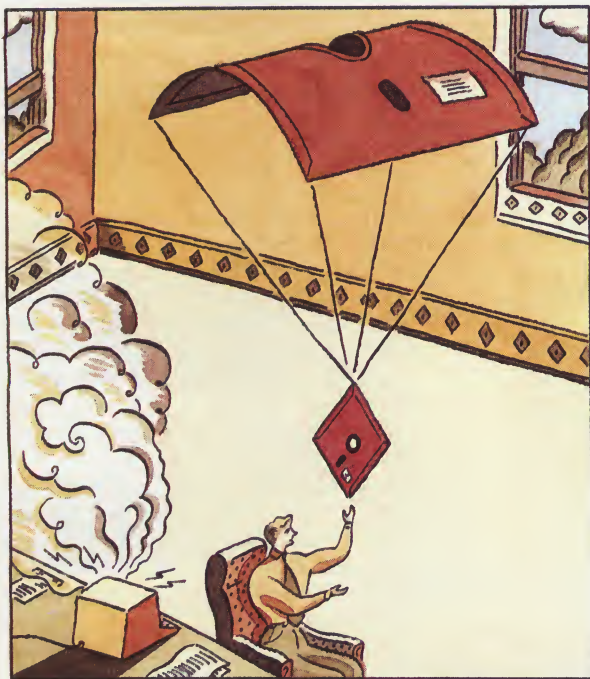
structure in your backup as it is on your original, you will have to add an /E to the command. Type it to look like this:

```
XCOPY C:\ A: /S/E
```

Let's say you've used the commands above to do your first backup, and now you don't want to fool around with copying all your files from one disk to another every time you back up. DOS lets you employ the "attributes" of its directory to back up only those files that have been changed.

Besides storing the name and size of each file, as well as the date and time each file was created or last modified, the directory keeps tabs on attributes that tell DOS to do things like hide certain kinds of files from normal Dir searches or prevent anyone from changing and erasing important files.

The attribute also uses a binary numbering system to determine a file's "ar-



discussed how you can use various parameters, or switches, of the DOS Xcopy.exe file to take the pain out of daily backups.

This month, we'll give you examples of how to put those tools to work.

You'll recall from last month's column that you can add the /S switch at the end of the Xcopy command to automatically copy your subdirectories with your files. This spares you from having

ILLUSTRATION BY MIKE KLEIN



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## DOS

chive" status. Whenever you create or modify a file, DOS turns on the file's archive setting by giving it a value of 1. Then, as soon as you make a backup copy of the file, either with the standard Backup command or by using Xcopy with an added /M switch, DOS will turn off the archive setting by giving it a value of 0. After you've run either of these commands and you subsequently use

XCOPY /M  
or  
BACKUP /M

to copy your files, DOS will skip over any file with an archive value of 0, since this setting tells DOS the file was already backed up.

If you modify even one character in a file that has an archive value of 0, DOS will instantly change the archive setting

**Nothing gives a user religion faster than a hard disk that's starting to groan like a Rambo soundtrack.**

of this file back to 1. Then, the next time you use Xcopy /M or Backup /M, DOS will see that the file has been changed and copy the newly modified file. Doing so will also reset the archive value of the original file to 0—unless you use an /A switch rather than an /M. The /A tells Xcopy to do everything that /M does, except that when the copying process is finished, DOS won't reset the archive value of the original file to 0.

If you really need to, you can fiddle with the archive setting for any file by using the DOS Attrib command. If you have a file called File.txt and you want to turn the archive setting on, you can type

ATTRIB +A FILE.TXT

To turn this file's archive setting off, type

ATTRIB -A FILE.TXT

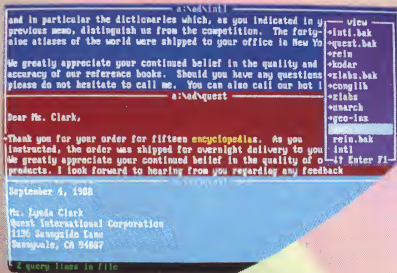
To examine the current value, type

ATTRIB FILE.TXT

If DOS displays an A before the filename, the archive setting is on. If you don't see an A, the setting is off.

Other switches help you automate the backup process using Xcopy. You

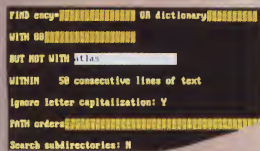




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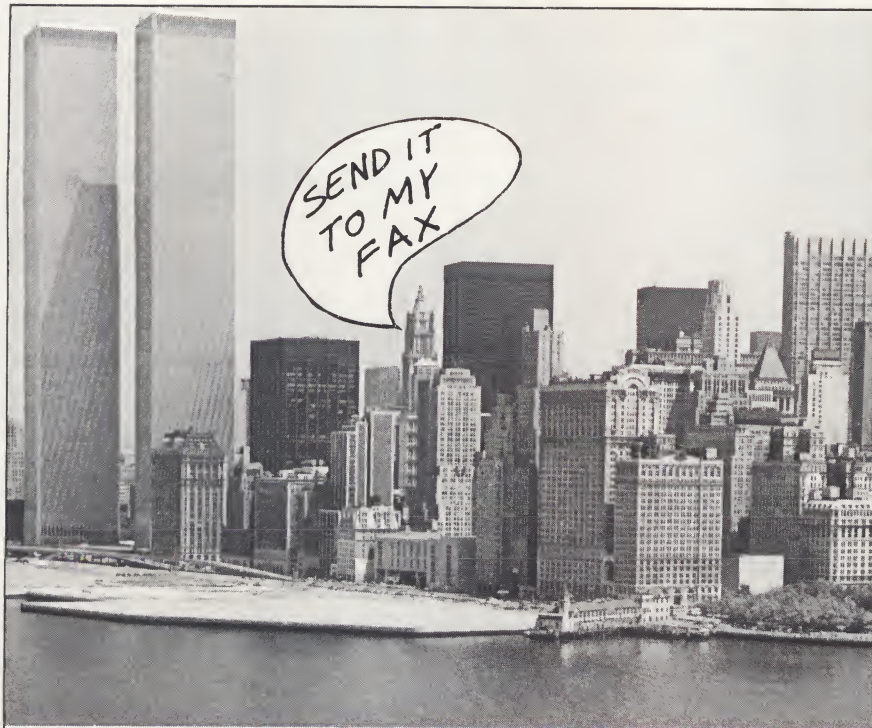
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## DOS

can add a /P, and DOS will list files one by one and ask whether you want to copy each. Type Y to back up a file, N to skip over it.

Adding a /W tells DOS to wait for you to insert a floppy disk before it goes on. A /V tells DOS to verify that it wrote a copy of the file to your backup disk. And by adding a /D and a date (in :mm-dd-yy format), you can tell Xcopy

**Add \P to Xcopy;  
DOS will ask if you  
want to copy each  
individual file.**

to copy only files that you created or altered on or after the day you specify. By creating two simple batch files—Daily.bat and Current.bat—you can make the process totally painless. As long as your system's date is accurate, you won't even have to enter the date manually; DOS will do that for you. First, use your pure-ASCII word processor to create Daily.bat:

```
ECHO OFF
REM THIS IS DAILY.BAT
ECHO | MORE | DATE > BACKIT.BAT
BACKIT
```

Next, create Current.bat:

```
REM THIS IS CURRENT.BAT
XCOPY C:\ A: /S /D:%4
DEL BACKIT.BAT
```

For this to work, Daily.bat, Current.bat, and the DOS More.com utility must all be in the directory you happen to be using or in one (such as C:\DOS) that your Path command knows about, and you must have a blank, formatted disk inserted in drive A:. Then just type "Daily" at the end of each day, and DOS will automatically back up every new or newly modified file you worked on that day.

Remember, if you're copying a lot of files and fear you'll run out of disks before the task is through, you should specify an /M with the /S switch, and DOS will alert you when a disk is full. You can then insert blank, formatted disks into drive A: as you need them and repeat the Xcopy command until all your files are copied. ■

*Paul Somerson is editorial director of PC/Computing and the author of PC Magazine DOS Power Tools, published by Bantam Books.*



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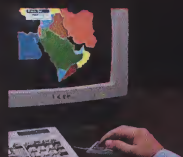
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# TOOLKIT

By PAUL BONNER

**I** should say at the outset that Inset and I are old friends. We first met back in the summer of 1985, and, on my part at least, it was love at first sight. Here, I thought, was one of those rare programs that provide elegant solutions to problems never before addressed.

The problem Inset solved was fundamental. PC software was a house divided between programs that could produce and print text and those which could produce and print graphics, with none ready to answer the taunts from the Macintosh community: "We can print text and graphics on the same page. Why can't you?" Then came Inset, claiming the ability to merge almost any graphic image with the printed output of almost any PC program.

I had my doubts at first: it sounded too good to be true. If the giant developers of the most popular spreadsheets, word processors, and databases hadn't

figured out how to merge graphics into printed output from their own programs, how could a memory-resident program from tiny Inset Systems (then called American Programmers Guild) manage to do so for every PC program?

Preposterous as it seemed, Inset delivered on its promise, producing high-quality text-and-graphics pages with ease. It was the PC's first true response to the Macintosh: a program that could enliven dull, character-based PC output by wrapping text from WordStar around a graphic element, or by letting Lotus 1-2-3 print bar charts next to the numbers they represent, or by dropping a graphic image into a dBASE field.

Since that time, the general state of PC graphics output has improved immeasurably. We've seen the release of several fine desktop publishing packages. Many PC word processors have learned to draw boxes, and some can read and print graphics files. Excel has taught us that not all spreadsheet pie charts have to look like extra-large eggs. And with the advent of graphics-based operating environments such as Windows and the OS/2 Presentation Manager, the picture keeps getting better.

Still, for all the catching up that PC software has done, Inset continues to surprise and impress today as it did three years ago. And after several revisions since then, Inset does many things with ease that no other program has yet attempted.

At heart, Inset's latest release, Version 2.2, remains true to the original. The program offers two related functions: a screen-capture utility

that can save any text or graphics screen in an Inset PIX file, and a preview facility that can size the image and place it within the word processor text, worksheet range, or database record with which you wish to print it.

You insert an image into a document simply by placing its name within square brackets where you want it to appear (e.g., [Barchart.pix]). When you activate Inset by pressing its hotkey, an

**Inset's ability to paste graphics into text-oriented files brings Macintosh-like versatility to the PC.**

outline box appears on the screen showing the space that the image will occupy. This gives you a guide so that you can insert formatting commands to move other data out of that space.

Enhancements to Inset over the years have focused on making it faster and easier to use. Inset 2.0 introduced a graphics editor that allows you to control the size of captured images. With the editor, you can also add lines, rectangles, circles, and text (in a choice of five fonts) to an image. And you can copy and move blocks from the image and modify its color palette.

Another welcome enhancement in Version 2.0 was the addition of a preview feature that shows a representation of the image itself, rather than merely an outline box. This lets you see how the changes you've made to the image will affect its appearance on the page. It still isn't true Wysiwyg, but it does help with such tasks as wrapping text around graphics.

Inset 2.2 made great strides in printing speed, which is now up to 16 times as fast as in the original version, and the number of printers supported—more



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## TOOLKIT

than 200 now, as opposed to about 100 with Version 1.0.

The best enhancement so far may have been the release of Hijaak, a companion program that, besides duplicating Inset's screen-capture capability, provides a facility for converting graphics among a wide variety of screen and file formats, including PC Paintbrush (PCX), MacPaint (MAC), Amiga (IFF), scanner (TIFF), CompuServe image format (GIF), HP LaserJet (PCL), Encapsulated PostScript (EPS), Lotus (PIC), and Inset (PIX) formats.

Hijaak makes the vast libraries of clip art that have been developed in Macintosh, Amiga, and GIF formats available to Inset users. And since Hijaak's file conversion takes place at the highest resolution level supported by the source and destination formats, rather than at your screen's resolution, an image converted by Hijaak prints at a much higher resolution than one captured with Inset. Inset can use Hijaak images needing up to 1.6MB of RAM.

Despite its impressive features and easiness to learn, Inset is not a replacement for a full-featured desktop publishing program. Rather, it is an alternative to desktop publishing that may be more appropriate for many users. I wouldn't tell people doing publication design on PageMaker to switch to Inset. On the other hand, I wouldn't recommend PageMaker to business users who want to include 1-2-3 graphs in business plans, or who want to print scanned images in database records.

The key to Inset is that it extends the power of the programs you already use. If you want to put text and graphics on the same page, there's no need to buy a complex and expensive desktop publishing system, to learn to use a new spreadsheet, or to wait for PC databases to support graphics as well as Mac databases do. Inset extends that capability to all your programs and, in doing so, enriches them. ■

*Paul Bonner is a senior editor of PC/Computing. He claims he wouldn't trade his copy of Inset for all the scissors and paste-pots in China.*

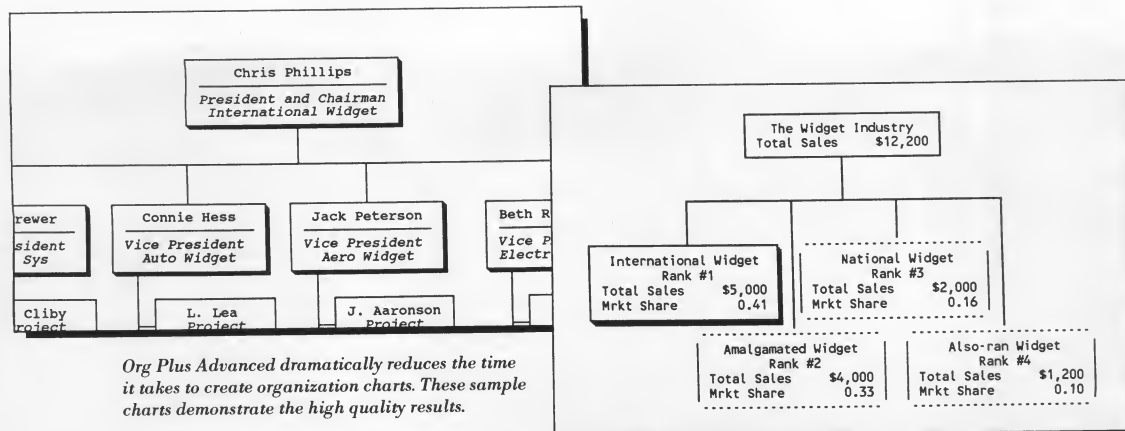
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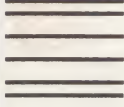
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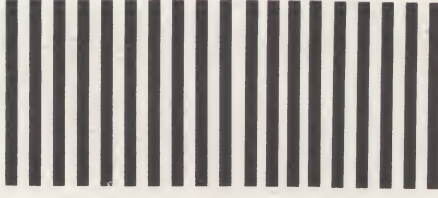
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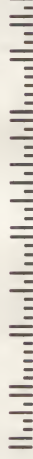


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# HELP!

Edited by JEFF PROSISE

**I** recently deleted a set of copy-protected files from my hard disk and removed the directories they were stored in, thinking I could reload them from the original diskettes. The programs could not be reinstalled, however, and the unerase utilities I have tried haven't been able to recover the originals. Any suggestions?

**Rob Ware**  
Dallas, Texas

Just one. Stay away from copy-protected programs if you want to avoid this problem. Copy protection may serve a purpose for software vendors concerned about piracy, but it also causes headaches for honest users who make honest mistakes.

If the commercial unerase utilities on the market are unable to restore your files, there is little, if any, chance of recovering them. Some software vendors will replace their copy-protected programs in cases like yours, in exchange for a nominal fee and the original program diskettes. Call the software company and check on its replacement policy. You might come away from the experience having lost nothing more than a little time and patience.

**I'm getting the message "Unrecognized command in Config.sys" from DOS just prior to the date and time prompts every time I boot up. What is it telling me, and what can I do about it?**

**George Wehmann**  
Shiner, Texas

The message you're getting is a warning that there's an error in your Config.sys file: DOS doesn't recognize one or more of the commands in it.

Your DOS manual lists all the valid

Config.sys commands and their syntaxes. For example, the Buffers command sets aside a number of disk cache buffers to speed up disk operations. The Files command specifies the maximum number of files that may be open at any one time, and Device loads a device driver.

The warning message may mean that you've inadvertently included a command that's not in DOS's vocabulary. Or the problem may be a typographical error in what would otherwise be a valid command, or an illegal parameter following a command.

Unfortunately, DOS isn't very explicit with its error messages when evaluating a configuration file. Check your Config.sys file and use a text editor to correct any errors you find. Then reboot your computer. The mysterious error message should go away.

**The laboratory I work in has several XTs with 360KB diskette drives and ATs with 1.2MB drives. Although a 1.2MB drive is capable of reading and writing regular double-sided/double-density diskettes formatted for 360KB, data written on these diskettes in an AT drive can't be read in an XT. Is there a reliable way to transport diskettes between the two machines?**

**Sheng-Nan Wu, M.D.**  
Gainesville, Florida

The only sure way is to equip your ATs with 360KB drives and avoid mixing 360KB diskettes with 1.2MB drives. You don't have to give up a 1.2MB drive to add a 360KB drive; the AT can handle both. Many ATs are configured with a 1.2MB drive as drive A: and a 360KB drive as drive B:.

Incompatibilities between 1.2MB drives and lower-density 360KB drives

arise because of differences in the drive hardware. High-capacity AT drives employ a mechanism capable of positioning the drive head over any single track on a diskette formatted with 80 tracks per inch. XT drives use a less precise mechanism that is accurate for only 40 tracks per inch. As a result, AT drives can write information to a diskette in such a way that it can't be read on an XT drive. But the same AT drive, with its superior positioning ability, can read anything written by an XT drive.

**I have seen advertisements and bulletin board notices for "screen saver" programs that blank the display screen after a certain length of time has passed with no activity. Should I be using one of these utilities when I leave my computer unattended and turned on for a period of time?**

**Joel J. Hebert**  
Oak Ridge, Tennessee

Screen-blanking utilities became popular in the early days of the PC, when most users opted for monochrome displays and adapters. IBM's original monochrome display used high-persistence phosphors to retain images on the screen and were thus susceptible to "burn-in." Burn-in can occur when the same image is left on the screen for a long time, typically many hours or even days, and can leave a shadow permanently imprinted on your display screen.

The problem is much less severe on color monitors. If you use a monochrome display and frequently leave your machine on, consider using a screen blanker to reduce wear on your monitor. Do the same for a color system if you are frequently away from the computer for extended periods of time.

These programs can be found on nearly any bulletin board, under one of



## HELP!

at least 50 different names. Screen blankers generally require 2KB or so of RAM; if you'd rather not give up the memory, you can just switch your monitor off before leaving.

**I have a 4.77MHz XT-compatible system that I would like to turbocharge to 8MHz or better. What are my options if I want to retain compatibility with the rest of my hardware? Is it possible to simply install a faster clock crystal, the way early AT users did to take their machines from 6MHz to 8MHz?**

**Gary Pien**  
Piscataway, New Jersey

There are many ways to speed up an XT, but using a faster clock crystal isn't one of them. This tactic worked on the AT because it used one clock for the CPU and another for the various support chips. An XT uses one clock for everything. Speeding it up would adversely affect other parts of the system.

The proper way to speed up an 8088-based PC is with an accelerator card. Simple accelerator cards that replace the CPU with a faster-rated 8088 or NEC V-20 can be bought for about \$250 and installed in minutes. They come with their own clock crystals and circuitry, which send the CPU an accelerated pulse (usually about 6MHz to 7MHz) and send all other components a standard 4.77MHz signal.

More expensive accelerator boards replace your old 8088 with a faster and more efficient 80286 or 80386. Such a board typically sits in an expansion slot and requires that you remove the old CPU and run a ribbon cable from the board to the empty CPU socket. Some of these boards, such as the Intel Inboard 386/PC, even come with their own high-speed 32-bit memories to boost system performance. One drawback to these systems is that if your machine is equipped with an 8087 math coprocessor, you'll have to replace it with a more expensive 80287 or 80387 math chip. Compatibility with other hardware is generally retained.

One reason to consider upgrading to an 80286 or 80386 is that it will enable you to run some programs that won't run on an 8088-based system. But be warned that not all such programs will work with accelerator cards. OS/2, IBM's new 80286-based operating system, is one example of a software package that is particularly hostile to anything but mainstream 80286 architectures. Only a handful of accelerator cards claim to run it.

**Rather than clutter my hard disk with hundreds of files or deal with cumbersome subdirectories, I format a new diskette for each job I work on and store all my files there. As a result, my backups take very little time and I'm well organized. What, if anything, am I missing?**

**Sally Ward**  
Portland, Oregon

You're missing the extra speed and convenience a hard disk offers. Dividing a

# DON'T JUST SIT THERE.

Calculating

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hard disk into a number of subdirectories is a simple and efficient way to keep from accumulating hundreds of files in any one area, and it's really no different from using an equivalent number of floppies—except that you never have to swap diskettes in and out. And it's lightning-fast by comparison.

You could combine the system you use now with your hard disk to get the best of both worlds. Simply create a new subdirectory for every new job, format a new floppy for backup, and use the subdirectories the same way you use diskettes now. The result: fast access times and painless backups.

**Do you know of a program I can install in my Autoexec.bat file to tell me the remaining space on my hard disk and the number of bytes of free memory every time I power up?**

**James W. Bennett  
San Antonio, Texas**

Yes. It's called Chkdsk.com, and it comes free with DOS. When you type

"Chkdsk" at the C: prompt, this utility displays your total disk capacity, available disk space, total memory, free memory, and other vital statistics.

**I feel lonesome as the owner of an IBM PC-XT Model 286 computer. No mention is ever made of it in software advertisements or product reviews, so it's difficult to tell what will work with it and what won't. Can I assume that products designed for use on a generic XT will work on the 286 version? How about products advertised for the AT?**

**Richard G. Goodyear  
Bonifay, Florida**

With few exceptions, any piece of software that runs on an XT or AT will also run on the XT Model 286. The Model 286 features downward compatibility with earlier IBM machines based on the 8088 microprocessor. Its AT-like architecture, anchored by an 80286 CPU, permits it to run almost any program

designed for the AT. Even the early releases of OS/2, which were notorious for not working with many machines besides a stock IBM PC AT, ran on the Model 286.

The same promise of compatibility does not hold true for add-in hardware. In theory, the Model 286's AT-style expansion bus will accept any board designed for an XT or AT. In practice, however, while XT boards can be easily used, most AT boards are too large to fit inside the case. The XT Model 286 is housed inside a standard XT case. The classic AT case stands about an inch taller. AT boards designed to take advantage of the extra inch of real estate simply don't have enough headroom in the Model 286.

Some manufacturers sell AT-compatible boards specially cut down for the XT Model 286. Before you buy, check that the board you're considering will fit in your computer.

**I have been disappointed to find that most of the public domain programs I download**

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## **HELP!**

from bulletin boards are written for color monitors. Is there any way, short of modifying the programs themselves, that I can adapt them to work with monochrome screens?

**Lili Ziesmann**  
Rio Rancho, New Mexico

In general, no. A well-written program will either sense what type of video hardware it's running on and adjust accordingly or allow you to change its configuration with some sort of installation program or command-line switches. Many public domain programs, particularly games, will run only on color systems.

**I am interested in learning about word processing and would like to start by finding a good book on the subject. While I haven't been able to find books on word processing per se, I have found several books on WordPerfect and WordStar. Are these word processing books? If not, where can I turn for help?**

**Kamel E. Mudarry**  
Brighton, Massachusetts

Both WordPerfect and WordStar are commercial word processing programs. Their user interfaces are quite different, but they and other programs, such as Microsoft Word and XyWrite, are geared toward a common goal: to help you create and edit documents in the fastest and most flexible manner possible.

You're not likely to find many general books on word processing. But as you've already discovered, you will find a host of books explaining the use of individual word processing packages. If you haven't decided which software product to buy, scanning through books written about them will help you get a feel for how they operate and which one may be the best for you.

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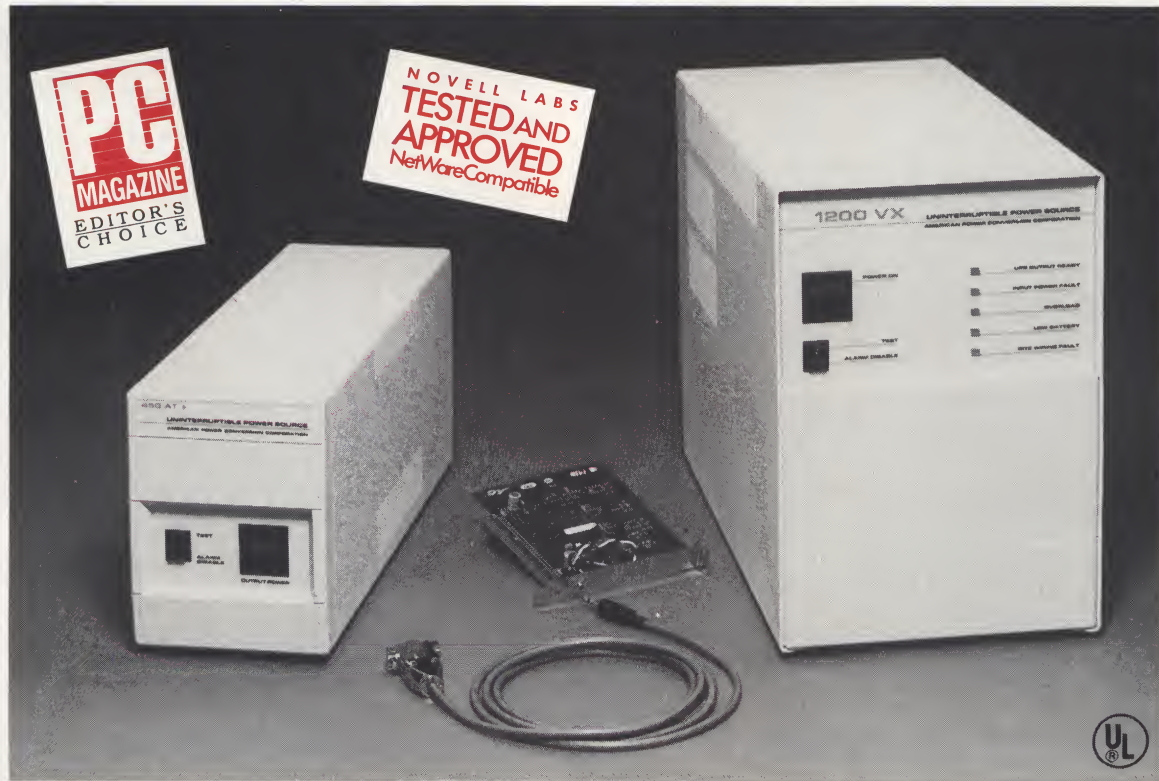
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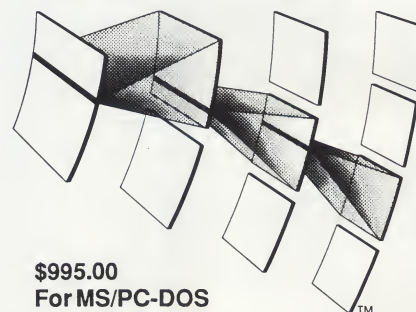
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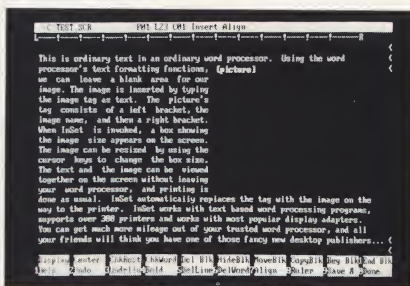


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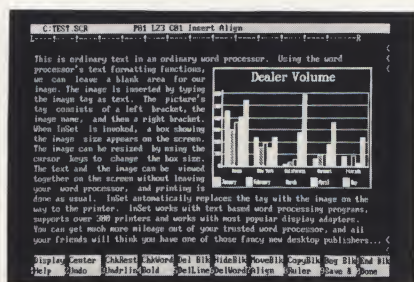
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# BOOKS

## **Blue Magic: The People, Power and Politics Behind the IBM Personal Computer**

BY JAMES CHPOSKY AND TED LEONSIS  
FACTS ON FILE PUBLICATIONS, \$19.95

IBM was not the first company to market a personal computer, but it was the one that made the PC the standard in office automation that it is today. How



IBM came to assume that role, the decisions made along the way, and the people who made them are the subject of *Blue Magic*, by James Chposky and Ted Leonsis. Chposky, a freelance business writer, and Leonsis, author of several technical books on the PC and PC software, have written a lively and informative corporate adventure.

*Blue Magic* is about IBM CEO John Opel's "Knights of the Round Table," who put their careers on the line to carry out a mandate from the very top of IBM. Protected by Opel and insulated from IBM's usual corporate constraints, they incurred the hostility of conservative elements within the company. Their freedom, however, created even greater pressures to solve problems and have the PC ready for market less than a year from the time the project was conceived. Desktops everywhere bear evidence of their success.

*Blue Magic* details the corporate politics of this remarkable project, but it doesn't address the technical development of the PC. You don't really see the machine as it's taking form.

Instead, the book takes you on a fast-paced tour of the personalities involved in the project and examines their relationships within IBM. The "magic" of the title refers both to the PC and to the unprecedented departures from IBM traditions that were made during the development of the machine, the procurement of subassemblies, and the marketing of the first IBM PC.

The scant attention given to the design of the PC, and to the technical problems that the team had to solve, is disappointing. You don't expect—or want—a book like this to be a technical manual, but it is unfortunate that the technical explanations are weak and sometimes misleading.

For example, the book describes the significant difference between an 8-bit channel and a 16-bit channel by saying that, with the 8-bit channel, "twice as many bits would have to be moved to execute any given operation." A better explanation would be that 8-bit systems

***Blue Magic* details how IBM CEO John Opel's "Knights of the Round Table" put their careers on the line en route to creating the PC.**

need twice as many operations to move the same amount of data. Another disappointment is that this discussion appears after several other isolated references to 16-bit architecture, suggesting that the book was written as episodically as it reads.

*Blue Magic* is entertaining, but you finish it with the feeling that a great deal has been left out. Much essential information still lies locked away at IBM, whose executives did not cooperate with the book's authors. *Blue Magic* is like DOS and its 640KB memory barrier: OK as far as it goes, but you know there should be more.

Those shortcomings, however, are outweighed by the interesting subject and by the degree to which the book looks at the IBM ethos and the select group of individualists who managed to stay independent of corporate constraints long enough to create a new standard in personal computing.

—John O. Schoenbeck

## **Three Scientists and Their Gods: Looking for Meaning in an Age of Information**

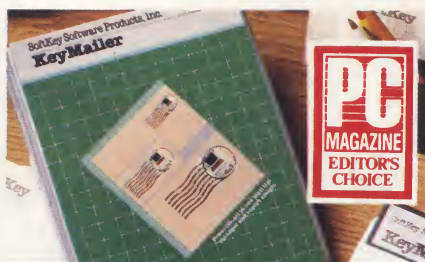
BY ROBERT WRIGHT  
TIMES BOOKS, \$18.95

"The universe is a computer" may sound like a lyric from a bad punk rock song, but it happens to be the cosmological principle advanced by Ed Fredkin, a former MIT scientist who is one of three extraordinary individuals Robert Wright examines in his book, *Three Scientists and Their Gods*.

Fredkin not surprisingly occupies a red-light district of establishment science. So do Harvard professor E. O. Wilson, founder of sociobiology, and

Kenneth Boulding, an economist and Quaker who believes in an emerging collective consciousness. What these three scientists share (besides controversial reputations in their respective fields) is a belief that *information* plays a transcending role in nature.





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## BOOKS

Armed with his own belief in the self-evidence of Darwinian evolution and a willingness to concede "purpose" in the universe, Wright sets out to explore these theories—and the lives of their progenitors—hoping to shed light on that troublesome place where science meets religion, where information becomes "meaning." He emerges with three rich intellectual portraits and a keen interdisciplinary glimpse of the ways in which information can be organized into reality.

Fredkin's inflammatory thesis, for example, boils down to a belief that information, not matter and energy, makes up the universe. Taken as metaphor, his theory could provide an elegant tool for viewing certain natural phenomena: "[Fredkin] finds it difficult to believe that nature, having generally possessed an artless elegance, is at heart a very baroque being. And if she *sounds* baroque when expressing herself in the language of physics, maybe the language of physics is the wrong language."

But Fredkin does not intend his theory to be taken as metaphor. He maintains that information is a concrete entity. Most physicists do not warm to this notion, in part because it begs the question of who or what programs the Great Universal Computer. And Fredkin's impetuous and undisciplined manner of research hasn't made the theory more acceptable.

Then there's E. O. Wilson, who advanced the notion of sociobiology in his book of the same name in the mid-1970s. Our genes undeniably inform our behavior, though the extent of their influence continues to be debated endlessly, frequently in the oversimplified guise of "nature versus nurture." Wilson, however, does not hedge in arguing that moral intuitions are based in genes.

Wright carefully distinguishes Wilson's sociobiology from Herbert Spencer's social Darwinism, while showing that parallels do exist.

Finally, we meet Kenneth Boulding, an independent and prolific social scientist who subscribes to a kind of holism in consciousness. Boulding sees a symbiosis between natural and social evolution, each moving the other toward greater complexity. The upshot is an emerging collective consciousness: human society as organism. Our own self-cognizance works alongside this upward-spiraling evolution. "But why this happens," Boulding concedes, "there's really no good theory on."

*Three Scientists and Their Gods* is cogent and engaging; Wright seeks to explore, not to conclude. He brings to the task a tremendous talent for explaining difficult theories to a general audience without cheating his subject. Philosophers and physicists will not be disappointed.

—Marty Jerome

### Looking Good in Print: A Guide to Basic Design for Desktop Publishing

BY ROGER C. PARKER

VENTANA PRESS, \$23.95, SOFTCOVER

One result of the so-called desktop publishing revolution is output that has been referred to as "laser crud": pages that clearly have not had the benefit of a graphic designer's eye. Laser crud is not only visually offensive, it also usually obscures a publication's intended message.

*Looking Good in Print*, by Roger C. Parker, a marketing consultant who also wrote *The Aldus Guide to Basic Design*, offers a layman's primer on principles of graphic design, typography, and print communications. The new book will have staying power on anyone's bookshelf because it is not hardware- or software-specific.

Parker's book is divided into three sections. The first is an overview of the basic terms and concepts that form the building blocks of graphic design. The second presents a series of page makeovers—examples of poorly designed pages, contrasted with the same pages redesigned. The third is a discussion of issues related to specific types of publications, with information on producing newsletters, books, and business correspondence.

The book succeeds in presenting the basics of the sometimes obscure discipline of graphic design, and it does so in simple, straightforward language. The advice is generally sound and should not intimidate the uninitiated in any way. The book is clearly laid out. Each new section in Part One is summarized in concise paragraphs, with key points set in boldface type in the left-hand margin. This makes it easy to skim for the fundamental points. Parts Two and Three are also clearly laid out and amply illustrated.

Unfortunately, the illustrations do not always reflect the wisdom of the advice. Parker notes in the introduction that he resisted the temptation to hire a professional graphic designer—and it shows. For example, a sample that illustrates text running around a graphic



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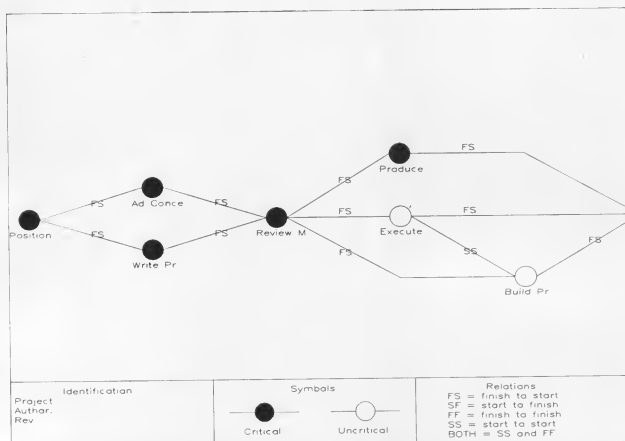
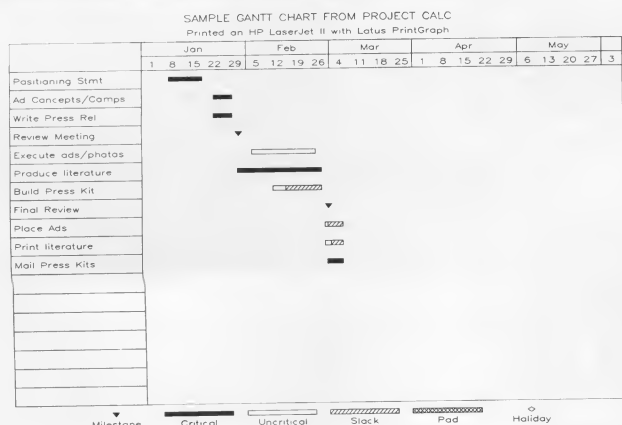
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## BOOKS

shows body text running around a nonsensically placed portrait of George Washington, with literally no space between the text and the graphic.

The book is a good starting point for those who feel overwhelmed by the design aspects of desktop publishing, but users should heed the advice the author gives at the end of *Looking Good in Print*: supplement this book with professional advice or with other books on the subject.—*Diane Burns and S. Venit*

### IBM PS/2 Technical Guide

BY CAROLINE M. HALLIDAY AND  
JAMES A. SHIELDS

HOWARD SAMS AND COMPANY, \$24.95

The *IBM PS/2 Technical Guide* attempts to explain and evaluate, in a single volume, the secrets of the PS/2 line—from Model 25 through Model 80—as well as its accessories, peripherals, operating systems, and languages.

The book keeps the amount of material manageable by giving a descriptive tour of the PS/2 line, or, rather, the older part of it. It misses the Models 50Z and 70 (as well as Version 4.0 of

DOS), which were released after the text was prepared.

In narcotic prose, Caroline M. Halliday and James A. Shields, a former technical editor and the senior technical editor, respectively, of *PC Tech Journal*, describe each PS/2, its features, and its options in much the same fashion as the IBM promotional materials from which the book was derived.

If you have a PS/2, you should know enough about it to make this book unnecessary. If you're thinking of buying a PS/2, you may find it helpful.

The *IBM PS/2 Technical Guide* evaluates the performance of each PS/2 model on commercial applications and compares the results with similar benchmarks from a sample of competing computers. The results, unfortunately, are often so overanalyzed that they invite confusion.

Background material on technical features and system operation is mostly adapted from the IBM Technical Reference manuals. The *IBM PS/2 Technical Guide* is austere but generally more readable and comprehensible than

the original. The book lacks the detailed references of the IBM manuals, but it can serve as a go-between, a volume that makes the Technical References more accessible.

This is not a book for beginners, however. Where the IBM Technical Reference manuals open the door for you—and kick you out, naked, into a blizzard of concepts and terminology—the *IBM PS/2 Technical Guide* supplies trousers and suspenders, but not the long johns. You'll need a fundamental understanding of PCs to work your way through it, but you'll finish it knowing more than when you started.

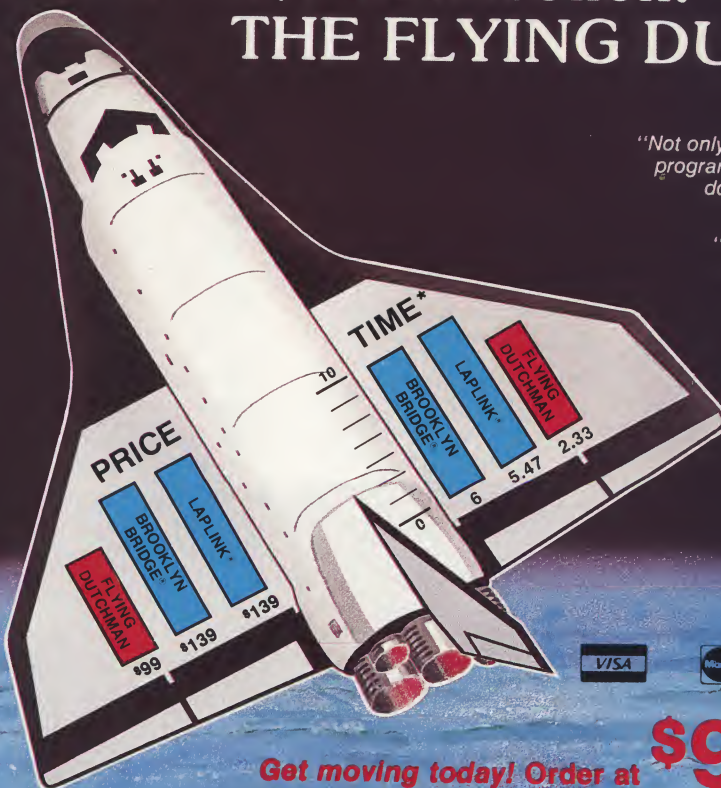
—Winn L. Rosch

*John O. Schoenbeck lives and writes in Cleveland, Ohio. Marty Jerome is an associate editor of PC/Computing. Diane Burns and S. Venit are the founders of TechArt, a San Francisco-based graphic design and production firm that uses desktop publishing technology. Winn L. Rosch, author of several books on computing, is a contributing editor of PC/Computing.*

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Others can't touch CO/SESSION's ability to communicate in the background. A technical support person can transfer, delete, display or rename files and directories without interrupting a user's foreground activity.

You can also troubleshoot PC users remotely, even displaying their autoexec.bat and config.sys files in the background to diagnose problems in seconds. Remote support has never been faster or easier!

## LESS EXPENSIVE

For about half the price of Carbon Copy Plus or Close-Up, you will get more functions and features. You can even upgrade Carbon Copy Plus to CO/SESSION for less money than their own 5.0 upgrade.

## TOTAL SECURITY

Seven levels of security provide you complete control of all incoming and outgoing calls, eliminating unwanted access to restricted and privileged information on remote PCs and networks.

## YOU'LL GIVE US AN A+

Not only do we have the best remote access software at an irresistible price, you even receive complete technical support and marketing assistance featuring consumer ads in leading end-user publications.

So, for the software and support that you need, call Triton and ask for CO/SESSION. Then give yourself an A+ for being so smart.



Triton Technologies, 200 Middlesex Essex Turnpike, Iselin, NJ 08830 (201) 855-9440

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What is your PC doing at home ? Are you bored with it ?  
 At most you may use it to do your office work or play some get-bored-quick computer games.  
 Where are the promises of a home-use computer ? Education ? Wholesome entertainment ? Creativity ?  
 All these years, you and your family have been denied the joy of owning a PC !!! The problem lies in the fact  
 that the PC standard lacks a decent music system.  
 Don't despair, we are here to deliver the promise which the PC standard has not fulfilled

Introducing.....

## THE MOST FASCINATING and MOST ENJOYABLE

Add-on for your PC ( XT/AT/386 )



### 12-Voice Stereo Music Synthesizer

#### THE MUSIC REVOLUTION

NO MUSIC TALENT ? Or rather no one has ever given you the right musical tool. C/MS will change your idea about music FOREVER. In a matter of MINUTES, someone who knows next-to-nothing about music will be wielding musical power of a full orchestra, experiencing the power of the most awesome musical tool ever to appear on planet earth. For those who are familiar with music, C/MS will be the passport to infinite creativity freedom.

#### THE ORGAN WITH INTELLIGENCE

The Creative Intelligent Organ (Software) is an ideal tool for the absolute beginner. One could play full

orchestra

music on the PC

keyboard with

one finger, com-

mand change of

instruments,

moods, turn and

twist the song

anyway you like

and have hours and hours of

fun without even knowing any musical

rules. Yet this software will still satisfy the

demanding lot -- you could never find another

easier or lazier way to play an instrument.

You would appreciate instantly the money

you have saved from buying expensive syn-

thesizers or organ. The intelligence of this

software adds rich accompaniments to your

one finger play in REALTIME !!! And the

Intelligent Organ Software worth \$69 is

now bundled FREE with your purchase of

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songs for you to enjoy and learn).

SIT BACK AND RELAX

Enjoy the numerous

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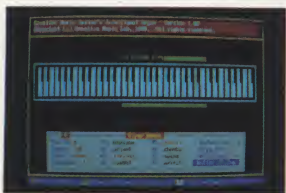
ground while you

are working on the

computer ! You can

create albums of

your favourite songs.



#### COMPOSE YOUR OWN MUSIC

C/MS has powerful tools to make this seemingly formidable task as simple as 1-2-3. Complex musical notes are reduced to digits and characters which you could type-in using any word processor. Our Auto-Bass-Chord-Rhythm ( ABCR ) generator adds complex accompaniments to your songs. Sophisticated musical pieces that used to take days can now be accomplished in minutes. There is no limit on how far you can go in this direction. The enjoyment and satisfaction derived is beyond description.

#### SING-ALONG & ANIMATED PLAY

Create Sing-Along which can display lyrics synchronously with the music. Make animations that dance along with your music. They are fun and educational.

#### FOR SOFTWARE PROGRAMMERS

You can interface your programs (in C, Pascal, Assembly or Basic) easily with C/MS. They will be fatally attractive with C/MS music.

#### WIDE APPLICATIONS

There are many ways to use C/MS; at home, in schools, in offices and even in business. Any one application you find useful will be well worth your money spent. More C/MS software coming your way.

#### WHAT OTHERS SAID OF C/MS

• Incredible ! • Fascinating, marvelous, very enjoyable • Highly recommend this package • Save a bundle from buying an organ • You must see to believe it.

#### BOUNTIFUL C/MS Package only \$195

Consist of the • CREATIVE MUSIC CARD with built-in power amplifier to drive speakers, headphones or home stereo directly • 5 diskettes and 3 manuals.

Software includes : • COMPOSER • ABCR • DEFine INSTRument • SING-ALONG • Animated PLAY • Programmer's Interface • SONGDISK # 1 • SONGDISK # 2

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#### COMMERCIAL USES

Presenting an idea, a product, a service or your company image can be made highly effective with music and synchronised animations - With the C/MS, your message will be LOUD, SWEET and CLEAR.

The C/MS PRESENTER ( optional )

is a powerful software for graphic presentation with C/MS music. It allows you to create EYE-POPPING presentations in a matter of minutes. -- only \$188



#### FREE 30-DAYS ENJOYABLE TRIAL

We are so sure that you will love C/MS that we offer you to try it, use it, enjoy it for 30 days. If you are not fascinated, simply return it for a full refund - no questions asked.

#### CREATIVE TECHNOLOGY P. L

☐ YES, Rush me \_\_\_\_\_ package(s) of Creative Music System + FREE Intelligent Organ at \$175 each = \$ \_\_\_\_\_  
 If I am not convinced, I will return it within 30 days for a full refund.

#### C/MS FREE-SONGWARE :

All the Song disks and demo disks listed below are FREEWARE. Just pay a \$4 copying/handling charge per disk.

Please Tick on those disks that you want :

☐ SONG DISK #3 ☐ SONG DISK #4 ☐ SONGDISK #5  
☐ SONG DISK #6 ☐ SONG DISK #7 ☐ SONG DISK #8  
☐ PRESENTER DEMO ☐ C/MS QUICK DEMO

Total No. of Disk : \_\_\_\_\_ x \$ 4 = \_\_\_\_\_

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# PERFECT IO

By PAUL BONNER

**T**he add-in facility found in Release 2 and later versions of 1-2-3 is Lotus's answer to everyone who has ever sighed, "Lotus 1-2-3 does *almost* everything I want to do with a computer. If only it could do the rest."

Since the add-in facility, originally found in Symphony, was incorporated into 1-2-3, dozens of add-in products have transformed it from a great spreadsheet with mediocre graphics and data management features into an operating environment with access to sophisticated word processing, flat-file and relational database managers, three-dimensional graphics, project management, high-quality page design, and other functions. And you still get that great spreadsheet at its core.

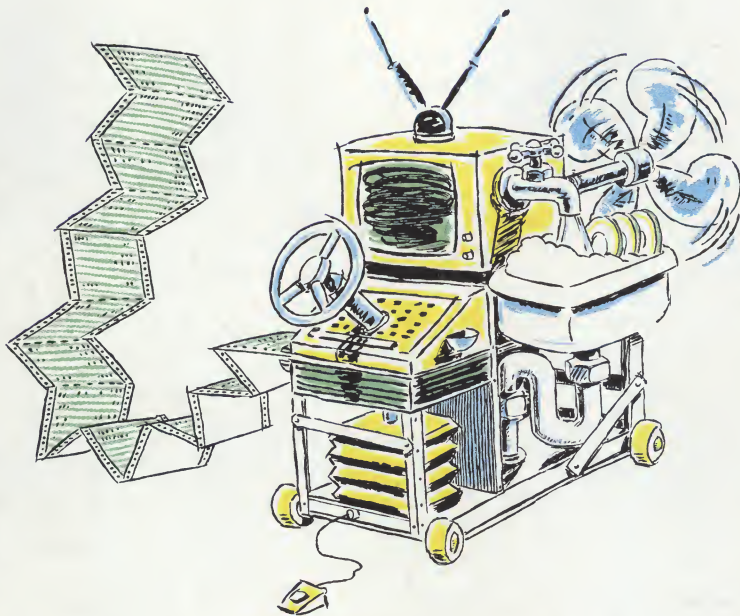
Here are our ten favorite Lotus 1-2-3 add-ins.

## Allways

Want to make those numbers in your quarterly report look a little prettier? Use Allways to print your successes in 18-point bold and hide your low points in 6-point italic behind a heavy colored tint. *Funk Software, Inc., Cambridge, Mass., \$129.95*

## @BASE

Allows you to browse through, select, cross-tabulate, and extract data from dBASE files from within 1-2-3, to create new .dbf (dBASE format) files, and to transfer data from 1-2-3 worksheets into .dbf files. Best of all, you don't even need dBASE to use it. *Personics Corporation, Maynard, Mass., \$195*



## Informix Datasheet Add-In

Adds heavy-duty SQL-based relational database capabilities to 1-2-3, along with file compatibility with Informix's other PC and minicomputer databases. *Informix Software, Inc., Menlo Park, Calif., \$199.95*

## Look & Link

Delivers Release 3's ability to create dynamic links between worksheets to Release 2 of 1-2-3; also lets you view two worksheets at once. So who needs Release 3? *Personics Corporation, Maynard, Mass., \$99.95*

## Note-It Plus

A spreadsheet annotator that lets you attach 500-character notes to as many as 250 worksheet cells, telling you (or your auditor) exactly what the formula  $A18 * @SUM(C43..M62) / @AVG(R1..62)$  is supposed to mean. *Symantec Corporation, Cupertino, Calif., \$79.95*

## Project Calc

With this add-in, project management comes wandering down the critical path, Gantt charts in hand, and

marches straight into the hearts of Lotus 1-2-3 lovers. *Frontline Systems, San Francisco, Calif., \$149.95*

## SeeMORE

This product uses three tiny but legible fonts to display up to 180 columns by 58 rows on a single screen. *Personics Corporation, Maynard, Mass., \$79.95*

## 3-D Graphics

Adds a third dimension to 1-2-3 graphics: 3-D bars, surface graphs, financial graphs, and the like. No special glasses required. *Intex Solutions, Needham, Mass., \$95*

## 3-2-1 BlastOff

A spreadsheet compiler that makes the cursed Wait message go away five times as fast if you've got a math coprocessor,

## The ten best add-ins for transforming 1-2-3 into the ultimate power tool.

or three times as fast without one. Because it works within 1-2-3, you can still change formulas on the fly. *Frontline Systems, San Francisco, Calif., \$149.95*

## Write-in

Style sheets, mail merge, block moves, and left, right, or centered justification—the most complete word processing add-in for 1-2-3. *Blossom Software Corporation, Cambridge, Mass., \$129.95* ■

*Paul Bonner, a senior editor of PC/Computing, is awaiting an automatic story generation add-in for 1-2-3.*



# HOW TO AVOID THE CONFUSION IN PERSONAL COMPUTING

When the giants designed the Personal Computer and the Disk Operating System that makes your PC do what it's supposed to do, they forgot one IMPORTANT thing - To take the thorny and messy confusion out of DOS and MS-DOS commands.

Instead, the giants and their clone manufacturers did do one thing - provide PC users like you with a stack of manuals a foot tall that takes days to read and forever to understand! The commands are so confusing that you wish that you had never tried to master them. This is the reason why you are having those headaches with your clone, PC or PS/2.

What is the solution?

*The solution is using **DOS MANAGER**. With all its features, you will soon become a serious computer user - without the steep learning curve.*

## - MENU DRIVEN

**DOS MANAGER** is a powerful menu driven utility program which enables you to operate your system with just the touch of a key! Your menu choice or DOS command is carried out INSTANTLY.

## - DOS TRAINING

Instant on-screen instructions on basic DOS commands are only a key-stroke away, **DOS MANAGER's** DOS tutorial provides examples and hints on command use and file management. Excellent for training professionals with no time to waste - or anyone with no time to waste.



## - SAVE TIME

For fast results and no hassles, you need an interface that will get the job done with a minimum of key-strokes. Whether you are a professional, an expert, or just a beginner, you can now avoid the confusion of DOS and MS-DOS and the hassles that steal so much of your productivity.

## - DOS SHELL

Instant DOS commands with only a key-stroke or two! With **DOS MANAGER's** shell program you can run your application programs and call DOS commands at any time from within your application - and return to where you left! Unlike many other shell programs, **DOS MANAGER** is compatible with almost any program you care to run, limited only by your computer's memory.

## - System Requirements

256K memory with DOS or MS-DOS 2.0 or higher. Two floppy drives, or one floppy and a hard disk.

Now you can put your system under a single manager - The **DOS MANAGER** - and run your applications in a more organized and productive manner. Make your PC



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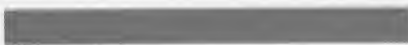
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## DESKTOP ACCESSORIES

- **PC-STYLE V1.2 (413)** Analyze the style, tone and readability of your writing. Will interface with PC-Type+, WordStar and ASCII text files.
- **EDRAW (1053)** Excellent program. Designed for technical drawing by engineers, teachers, etc. Draws lines, boxes, circles, logic and electronic symbols, and fonts for electronic circuits. Keyboard or mouse. Requires CGA.
- **PC-DESK TEAM (2603)** Set of nine desktop tools: alarm clock, calculator, phone book, appointment calendar, phone dialer, typewriter, and more.
- **HOMEBASE V2.0 (2608, 2612, 2613)** (3 disks) Outshines Sidekick. PC-Magazine Editor's Choice. Many features.
- **INSTACAL (2610)** Print wall-size calendar for any month or year between 1600-2200 A.D.
- **BAKER'S DOZEN (2821)** 13 great utilities, including recovering deleted files, printing text or spreadsheets sideways, built-in program debugging, and more.
- **PRO-MENU (3033)** Run DOS and other programs from menus. Automatic custom menu maker. Make it easy on yourself.

## PRINTER UTILITIES

- **DOT MATRIX FONTS (3061-3062)** (2 disks) Print out text in different fonts. Programs for IBM Proprinter, the Epson 800/1000 series, Star NX10 and NEC printers.
- **LASERJET FONTS/II (2721-2722)** (2 disk set) Downloadable fonts for the Laserjet Plus II.
- **LQ V2.1 (2724)** Produces high quality text on dot matrix printers.
- **LINCOMATIC BANNER (2714)** Make banners with different fonts & sizes. Excellent.

## HOUSEHOLD

- **MEALMATE (2014)** Plan your meals with this database of nutritional information.
- **FASTBUCKS (799)** Menu-driven home finance system. Easy to utilize.
- **HOME INVENTORY (1966)** Household inventory system. Create your own categories. Includes estate and will planning.
- **VIDEO TAPE LIBRARY (1998)** Catalog your video tape library. Menu-driven.
- **RECIPES V1.0 (2011)** Over 125 recipes. Adjust serving sizes from 1-99.
- **LITTLE BLACK BOOK (2606)** Creates pocket sized address book. Prints mini-alphabetized pages.
- **GARDENER'S ASSISTANT (2012)** Plan your garden in every detail.
- **VEHICLE MANAGEMENT SYSTEM (2013)** Predicts auto repairs, tracks MPG, etc.

## MISC. APPLICATIONS

- **DR. DATA LABEL (2327)** Professional mailing list program. Print on postcards, envelopes, and any size label.
- **FAMILY HISTORY (2203-2204)** (2 disk set) Creates files and genealogical reports.
- **BIORHYTHM (1990)** Calculate and print your own monthly chart.
- **STRESS & SHRINK (2006)** Includes a stress test and a personality test.
- **ASTROLOGY 9.5 (1916)** Calculate your own chart and print out.
- **LOTTO MASTER (1981)** Play the lotteries with a scientific approach.
- **MEMBERSHIP SYSTEM (1984)** Good for clubs, churches, etc.

- **HORSES (1999)** Handicap system for thoroughbred racing.
- **HEALTH RISK (2010)** Diagnose your ailments.

## WORD PROCESSING

- **PC-WRITE V2.71 (401-402)** (2 disks) Full featured word processor like the commercial versions.
- **MINDREADER (430)** New. Uses Artificial Intelligence to complete words and phrases. Learns your style.
- **PC-TYPE+ (421-423)** (3 disks) Jim Button's excellent W.P. Full screen editing, mail-merge, 100,000 word spelling checker, on-screen help, etc.
- **LETTER WRITER (405)** Easy way to write letters. Popular.

## GRAPHICS

- **FINGERPAINT V2.0 (1050)** Paint program. Includes 6 fonts & 81 sizes. Creates graphics with mouse or keyboard.
- **FLOWCHARTING (1078-1079)** (2 disks) Make your own flow charts. Customize own symbols, connect lines, etc.
- **KEYDRAW CAD SYSTEM (1001, 1002, 1065)** (3 disks) Powerful CAD drawing program. Uses keyboard or mouse. Requires CGA.
- **SIDEWRITER (1007)** Prints text sideways. Great for spreadsheets.
- **3-D (1003)** Create and edit 3-D objects. Requires CGA.
- **SIM-CGA (1027)** Run programs requiring CGA on your Hercules or compatible monochrome graphics monitor.
- **GRASP (1031-1032)** (2 disks) Create and run graphics demo programs. Uses any graphics card. Req. CGA.
- **LIGHTNING PRESS (2718)** Print-shop clone. Library of graphics for cards, letterheads, posters, newsletters, etc. Req. CGA.
- **CITY DESK (2513)** Simple and easy to use desktop publisher.
- **EGA TROPICAL FISH (1087)** Turn your monitor into a fish tank. Also on CGA.

## GAMES

- **JETSET FLIGHT SIMULATOR (102)** Fly your jet in zero visibility.
- **3-D CHESS (GAME9)** Best around! Play in 2-D or 3-D mode. Play back moves and save games. Great!
- **MONOPOLY (118)** Great graphics.
- **DND (119)** Similar to Dungeons and Dragons.
- **GLOBAL THERMAL NUCLEAR WAR (105)** A game before its time.
- **EGA RISK (GM11)** World domination in terrific color. Also has EGA Asteroids.
- **SLEUTH (117)** Murder mystery similar to the board game "CLUE."
- **CARD GAMES (109)** Includes Canasta, Hearts, Poker and Bridge.
- **18 HOLE MINIATURE GOLF (176)** Time honored game.
- **LAS VEGAS (175)** Includes Craps, Roulette, Poker, etc. CGA required. Basic on some.
- **WHEEL OF MISFORTUNE (181)** Guess the word, spin the wheel and watch out!
- **DIGITAL LEAGUE BASEBALL (GM40)** Pick your team and players. Good graphics.
- **CRIBBAGE (173)** Also includes Firefight, T-Road, Slot, Nuke, etc.
- **BRAIN TEASERS Vol 1.0 (281)** Questions in over 25 categories.
- **SOLITAIRE (GM40)** Four different games. CGA required.
- **TRIVIA GAME (130-131)** (Two disks) Comprehensive trivia game.
- **BRIDGE PAL (171)** Contract or duplicate bridge. Includes tutorial. Very good.
- **CENTIPEE (113)** Just like the arcade game Centipede.

- **FLIGHTMARE (112)** Futuristic fighter pilot game.
- **BASIC GAMES (107)** Includes Pacman, Lunar Lander, StarTrek, Breakout and others. Requires Basic.

## DATABASE

- **FILE EXPRESS (803-804)** (2 disks) Menu-driven, easy to use and powerful. Rated excellent by PC Magazine.
- **PC-FILE+ V2.0 (801, 805, 837)** (3 disks) Excellent. Full-featured with help screens. by Jim Button.
- **WAMPUM V3.2B (824, 825, 835)** (3 disks) Menu-driven dBaseIII clone. 640K RAM required. 80286 or 80386 and hard disk recommended.

## SPREADSHEETS

- **PC-CALC+ V1.0 (512-514)** (3 disks) The Complete Spreadsheet program. By Jim Button.
- **EZ-SPREADSHEET (509)** Simple and easy to use. Great for novice.
- **QUBECALC (508)** Unique and powerful 3-D spreadsheet.
- **LOTUS MACROS (601)** Saves much time and effort. Requires Lotus.
- **LOTUS TEMPLATES (602)** Ready to run. Requires Lotus.
- **LOTUS TUTORIAL (630)** Excellent. Beginning and advanced.

## BUSINESS

- **EZ-FORMS (1908)** Menu-driven forms generator.
- **EZ-FORMS EXEC V2.0 (2015)** Contains additional features to 1908.
- **EASY PROJECT V1.2 (BS27)** Complete project management system.
- **PC-GENERAL LEDGER (701)** Menu-driven accounting system. Easy.
- **PERSONAL FINANCE MANAGER (715)** Household budget manager. Keeps track of checking, savings, and investments.
- **MR. BILL (702-703)** (2 disks) Bill customers. Create invoices, client reports, audit trail, etc.
- **BIDS 'N' QUOTES V0.9 (BS26)** Prepares cost estimates, proposals. Does labor, material, subcontractor costs, etc.
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- **SBAS V1.3 (797)** Small business accounting system. Menu-driven. Excellent.
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- **SOAR V1.92 (BS20-BS21)** (2 disks) Accounts receivable program. Handles variety of services or products.
- **CK - CHECKBOOK V3.14 (755)** Full featured checkbook program with reports.
- **PC-PAYROLL (714)** Menu-driven payroll system.
- **EMPLOYEE MANAGEMENT (793)** Teaches the principles of the famous One-Minute Manager.

## EDUCATION

- **FUNNELS & BUCKETS (201)** Great learning game. Add, subtract, multiply & divide. Ages 5-10.
- **LETTERFALL V1.1 (282)** Improve your typing skills. Many levels.
- **BEGINNING SPANISH (211)** Learn basic Spanish.
- **SPANISH II (232)** Second in the series.

- **MATHPAK (202)** Tutorial with lessons in higher mathematics.
- **EDUCATIONAL PROGRAMS (207)** For pre-school and elementary.
- **ERYN'S ABC'S (270)** Teaches alphabet & numbers. Computerized Etch-a-Sketch. Ages 2-6. Requires Basic.
- **AMY'S FIRST PRIMER (248)** Teaches alphabet, numbers, counting, shapes, matching, etc. Ages 4-8. Requires CGA & Basic.
- **THE WORLD 3D (235)** Displays maps of the world. Requires CGA.
- **SAN MATEO EDUCATION (283)** Teaches math, chemistry & geography. Ages 8-16. Requires CGA.
- **SPELLING BEE (284)** Grades 1-12. Requires CGA & Basic.

## MUSIC

- **PC-MUSICIAN (302)** Compose music. Save and play it back.
- **PIANOMAN (301)** Turn your keyboard into a piano!
- **CHRISTMAS SONGS (311)** Includes many of your favorites.

## COMMUNICATIONS

- **RBBS BULLETIN BOARD (1107-1109)** (3 disks) Turn your computer into a BBS. Industry standard.
- **Q-MODEM V3.1 (1101, 1102, 1143)** (3 disks) Full featured modem program. Redialing capabilities.
- **PROCOMM V2.42 (1112-1113)** (2 disks) Menu-driven modem program. Considered better than most commercial programs.

## SECURITY/HACKING

- **COPY PROTECTION I (1219)** Instructions for unprotecting Brownbag, dBaseIII, PCDraw, Printshop and many more.

- **COPY PROTECTION II (1220)** Unprotect Report Writer, Clout, Castle Wolfenstein, Dollars & Sense, Grafwriter and more.
- **COPY PROTECTION III (1221)** Still more. Javelin, Sidekick, Spitfire, Symphony, Thinktank, and more.
- **VACCINE (1223)** Various programs to protect against Virus & Trojan Horse schemes

## DOS UTILITIES

- **DOS TUTORIAL (1301)** Teaches rudiments of using DOS.
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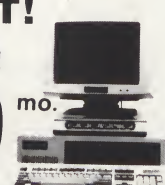
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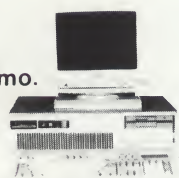
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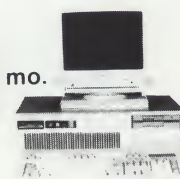
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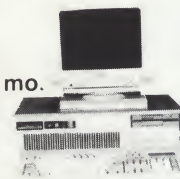
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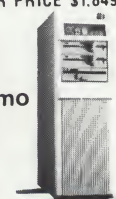
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- **FASTBUCKS V3.18-C (191)** - Menu-driven home finance package. Easy to use. Supports a Microsoft Mouse.
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- **BUSINESS LETTERS (303 & 304)** - (2 disk set) 650 business letters to fit all your needs. Edit w/ any word processor.
- **LEGAL LETTERS (611)** - 100 legal letters. Edit w/ any word processor.
- **MR. BILL V3.27 (311 & 312)** - (2 disk set) Time & billing package; costs, credits, reports, audit trail, etc.
- **PC-PAYROLL V2.45 (464)** - Menu driven payroll system; 100 employees or less.
- **LANDLORD V2.03 (585)** - Fast & friendly rental property mgmt.
- **EMPLOYEE MGMT SYSTEM (688)** - Determines requirements for jobs, tests employees/applicants, & prints report.
- **SOAR V1.92 (449 & 450)** - (2 disk set) Accounts receivable program. Handles a variety of services or products.
- **BILLPOWER V3.9 (601)** - A timekeeping, billing & bookkeeping program for small firms. Req. 450K & hard drive.
- **PRO PC-ACCT SYSTEM (526)** - Fully integrated G/L, A/P, A/R system. Menu driven, on-screen help, cross posting, unlimited accounts, & much more. Req 380K.



## COMMUNICATIONS

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- **PROCOMM PLUS TEST DRIVE (504)** - Everything you could possibly want in a communications package. Req. modem.
- **PC-DIAL V2.0 (466)** - Modem program by Jim Button. Smartkeys & more.



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- **COMPOSER (3)** - Create, save, edit, play, & print your music.
- **LETTERFALL V1.1 (119)** - Improve your touch typing skills; 16 levels.
- **ALGEBRA TUTOR (577)** - By Professor Weissman, teaches operations. CGA req.
- **BEGINNING SPANISH (121)** - Teaches vocabulary, phrases, etc. Basic required.
- **THE WORLD 3D (127)** - Display maps of the world. CGA required.
- **FUNNELS & BUCKETS V2.0 (130)** - Great learning game; add, subtract, multiply, & divide. Ages 5 - 10.
- **MATH-WHIZ (188)** - Teaches various math operations. Ages 5 and up. You choose the level. Basic required.
- **AMY'S FIRST PRIMER (133)** - Alphabet, numbers, counting, shapes, matching, etc. Ages 4 - 8. CGA & Basic req.
- **GRADE GUIDE V2.5 (118)** - Store, retrieve & analyze students' grades.
- **PC-QUIZZER V2.1 (308)** - A testing and training package. Requires 384K.

- **ANIMAL MATH/MOSAIC (181)** - Count objects & graphic learning tool. Ages 4 & up. CGA required.



## GAMES

- **SLEUTH V4.1 (89)** - Murder mystery game similar to the board game "CLUE".
- **BLACKJACK (95)** - Advanced blackjack game with tutor, multiple players. Best one yet. CGA or Hercules.
- **MONOPOLY V6.7 (108)** - Just like the board game, 2 to 4 players. CGA req.
- **CUNNING FOOTBALL (693)** - A dynamic game with excellent graphics. EGA req.
- **LAS VEGAS (116)** - Craps, Roulette, Poker, & more. CGA req., Basic on some.
- **3D CHESS V1.01 (215)** - Excellent chess game. Switch between 2D & 3D.
- **SAM SPADE V1.0A (226)** - Great detective game. Maze game; creates mazes.
- **SUPER PINBALL (212)** - 5 different games. CGA required.
- **WORDPLAY (367)** - Wheel of Fortune clone. You provide the prizes. CGA req.
- **ADVENTURE GAME TOOLKIT (595 & 596)** - (2 disk set) Create & play your own text adventure games. 2 levels.
- **PC-Pro GOLF (667 & 668)** - (2 disk set) A graphic based golf game. CGA req.



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- **FINGERPAINT V2.0 (282)** - Paint program; 6 fonts, 81 sizes. Use for desktop publishing, slideshow & cartoon playing. CGA, EGA, or Hercules.
- **PRINTMASTER GRAPHICS (319)** - Over 200 graphics. Printmaster Plus req. Order Disk #320 for Printshop version.
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- **PRINTMASTER GRAPHICS / 3 (550)** - Contains 165 graphics relating to animals & transportation. Printmaster req. Order Disk #590 for Printshop version.
- **PRINTMASTER GRAPHICS / 4 (701)** - Contains 86 graphics relating to computers, music & medical. Printmaster req. Order Disk #702 for Printshop version.
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- **DANCAD 3D V2.0E (424 & 425)** - (2 disk set) Advanced 2D/3D drafting program. Stereoscopic 3D wire frame animation. EGA, CGA, Hercules. 640K req.
- **CITY DESK V7.01 (197)** - Desktop publisher with graphics capability.
- **FLODRAW V1.00 (542 & 543)** - (2 disk set) Produces flowcharts, organizational charts, system diagrams, etc. CGA required.



## LANGUAGE

- **TURBO "C" TUTOR (489 & 490)** - (2 disk set) 14 lesson tutorial; learn to program in "C" language.
- **"C" LANGUAGE V2.1 (299 & 300)** - (2 disk set) Complete programming environment. Source, compiler, samples.



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- **HORSERACING (343)** - Handicapping for thoroughbreds.
- **ASTROLOGY V9.5 (284)** - Read your

- own chart from stars, moon, etc.
- **RECIPES V1.0 (445)** - Over 125 recipes, adjust serving sizes from 1-99.
- **EDNA'S COOKBOOK V1.16 (566)** - Record, file, list & print recipes. 2 drives
- **WEIGHT CONTROL (586)** - Programs designed to get rid of unwanted inches.



## PRINTER UTILITIES

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- **LASERJET FONTS/I (327)** - 30 + downloadable fonts for Laserjet Plus/II.
- **LASERJET FONTS / II (471 & 472)** - (2 disk set) More downloadable fonts for HP Laserjet Plus/II. Helvetica, Script, etc.
- **SPOOLERS (48)** - Contains 4 different print spoolers. A must for computerists.
- **ON-SIDE (560)** - Sideways printing program. Req. IBM or Epson printer.



## SPREADSHEET

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- **LOTUS PROGRAMS (28 - 32)** - (5 disk set) Contains as many applications and utilities that we could find. Requires Lotus
- **AS EASY AS V3.0 (302)** - Lotus clone. 52 column sheet, graphing, supports functions of 123, "WKS" files, etc.
- **LOTUS LEARNING SYSTEM (458)** - A tutorial that covers overview, applications, etc. Lotus NOT required for tutor.



## UTILITIES

- **DISK COMMANDO V2.0 (218 & 219)** - (2 disk set) Norton Advanced Utilities clone. Many features.
- **SIM-CGA (220)** - Great for most programs that need color (CGA) to run.
- **HOMEBASE V2.5 (528-530)** - (3 disk set) Great desktop organizer; linear database, editor/word processor, calendar appt. book, cut/paste operations, etc.
- **DOS HELP (255)** - Help screen for DOS commands, functions & batch files at your fingertips. For DOS 3.XX.
- **DOS TUTORIAL V4.4 (256)** - Menu driven, learn to use your computer.
- **LIST V6.2A (274)** - Best utility for viewing documentation or any ASCII file.
- **AUTOMENU V4.01 (280)** - Access programs, batch files, commands, etc.
- **ALT V1.05 (581 & 582)** - (2 disk set) Puts the power of Sidekick, Superkey & Norton Utilities, rolled into one at your fingertips. Hard drive required.
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- **SIDEWRITER (6)** - "Sideways" printing; great for spreadsheets.
- **CATALIST V3.2 (183 & 184)** - (2 disk set) One of the most powerful mailing lists on the market. Excellent.
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- **LETTERHEAD (69)** - Create and print your own letterhead on letters and envelopes. IBM/Epson comp. printer req.
- **GALAXY V2.3 (11)** - Easy to use word processor; menus & quick keyboard com-

- mands. Lots of features.
- **WORDPERFECT MACROS (189)** - Over 80 macros for Wordperfect V5.0.



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- **COMPASS (694)** - Interactive, menu-driven accounting, word processor, database, spreadsheet, calendar, on-line help screens & more.
- **MASS APPEAL (630)** - Superb mailing list manager. Requires hard drive.
- **SELECT-A-COLLEGE 88-89 (636)** - What to look for in a college, plus describes colleges and helps in the application process.
- **PERSONAL POET (718)** - Create custom poems from a variety of choices.
- **HOME BARTENDER GUIDE (708 & 709)** - (2 disk set) Recipes for 149 different drinks.
- **GRASP V1.10C (689 & 690)** - (2 disk set) A simple graphics programming pseudo-language.
- **THE NUTRITIONIST (670 & 671)** - (2 disk set) Rapidly and comfortably evaluate foods for the proper nutritional content.
- **FORTUNE TELLER V1.0 (675)** - Contains various programs for foretelling the future. Loads of fun.
- **EGA TREK V1.0 (677)** - Fight the Klingons and Romulans. Go where no man has gone before. Great graphics. EGA required.
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- Richard Petersen, Pres.

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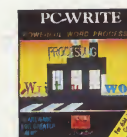
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Kits now available with VGA video and expanded hard drive options.  
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PC-FullBak  
Editor's  
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May 31, 1988  
**PC**  
MAGAZINE



### With the CompuAdd 286/10™

- Monographics video card and monitor
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- Optional 40MB or 60MB hard drive upgrades available
- Epson® LX-800 printer
- Software package includes:
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  - ✓ ZenWord™ for word processing
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14" tube EGA monitor and adapter card

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- Optional 20MB or 40MB hard drive upgrades available. Includes PC-FullBak backup software.
- Star Micronics NX-1000™ printer
- Software package includes:
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  - ✓ ZenWord for word processing
  - ✓ ZenCalc for spreadsheets
  - ✓ ZenLink for communications
- Paper, cable, and diskettes

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14" tube EGA monitor and adapter card

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## Computers with clout



Monitor optional

### CompuAdd 286/10™

PC  
MAGAZINE  
Editor's choice  
Feb. 16, 1988

- 80286 processor
- 6MHz and 10MHz processing speeds
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- 1.2MB floppy drive and dual controller
- Math coprocessor socket
- Your choice of keyboard
- Clock/calendar with battery backup

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- 80286 processor
- 6MHz-12MHz processing speeds
- 0 wait states
- 1MB RAM
- 1.2MB floppy drive and dual controller
- Your choice of keyboard
- Clock/calendar with battery backup

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## Monographics combo

### Monographics video card

Text mode: 80 col. x 25 lines, graphics mode: 720 x 348, parallel port

### Monographics monitor

12" Samsung™ flat screen with tilt and swivel base



**\$139**

## EGA combo

### EGA-480 card

640 x 480 resolution, and 256KB display memory

### EGA monitor

The best value in an enhanced color monitor, 14" high-resolution tube (13" diagonal)



**\$489**

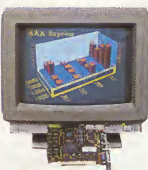
## Ultimate EGA combo

### Video-7® Vega Deluxe™

640 x 380, EGA, color, and monographics standards, ultra-high resolution

### NEC Multisync® II

Up to 800 x 675 lines resolution, .31mm dot pitch, 14" tube size



**\$869**

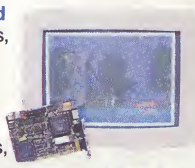
## VGA combo

### CompuAdd VGA card

640 pixels x 480 lines, with 16 colors or 320 x 200 with 256 colors

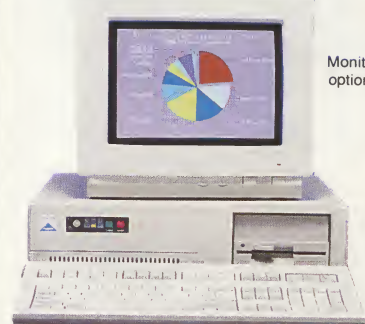
### VGA analog monitor

640 pixels x 480 lines, .28mm dot pitch, 14" tube with tilt and swivel base



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## CompuAdd Turbo/10™



Monitor optional

- 8088 processor
- 4.77MHz and 10MHz processing speeds
- 640KB RAM
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- Eight expansion slots
- Your choice of keyboard
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1.44MB, gray face plate for ATs . . . **\$135**

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## For IBM-ATs® and compatibles

- Mounting hardware
- Completely illustrated installation manual
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## For IBM-PC/XTs®, compatibles, and Compaq®

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- Mounting hardware
- Western Digital® controller
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**30MB Seagate (65ms) ..... \$310**

**40MB MiniScribe (61ms) ... \$379**

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**PC Tools® Deluxe (Utilities) Reg. \$40 ..... \$35**

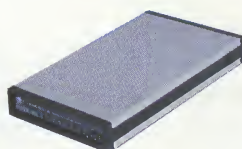
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**Flight Simulator (Game) ..... \$35**

**Reader Rabbit™ (Education) . . . \$23**

**Typing Tutor® IV (Education) . . . \$32**

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**2400 Baud CompuAdd (Internal) . . \$139**

**1200 Baud CompuAdd (External) . . \$89**

**2400 Baud CompuAdd (External) .. \$159**

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**PC I/O Serial port, parallel port, game port, and clock/calendar ..... \$65**

### Multifunction cards

**PC/XT multifunction card 384KB RAM, parallel port, serial port, clock/calendar, and game port for PCs or compatibles ..... \$199**

**AT multifunction card Up to 1.5MB RAM expansion, serial and parallel port for ATs and compatibles with OKB ..... \$99**

### Accelerators

**Charge Card 286™ ..... \$249**

### Memory cards

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**EMS XT with OKB ..... \$99**

**EMS AT with OKB ..... \$119**

### Mice

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**CompuAdd serial mouse ..... \$55**

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## FlashCards



**Editor's choice**

PC Magazine February 20, 1987



- Western Digital controller

- One-year limited warranty

- Installs in minutes

- 3 1/2" hard disk

- Allows boot from FlashCard

- Shock mounted

**FlashCard-20™ (MiniScribe, 65ms) \$319**

**FlashCard-30™ (MiniScribe, 65ms) Reg. \$339 ..... \$329**

**FlashCard-49™ (Seagate, 28ms) .. \$539**

**FREE**

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**PC-FULLBACK**

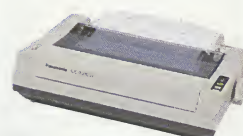
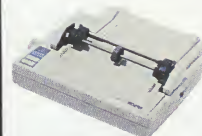
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- Easy to use
- Backs up and restores files
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**Epson EX-800 80 columns, 300cps draft, 60cps NLQ ..... \$476**

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CIRCLE NO. 280 ON READER SERVICE CARD.



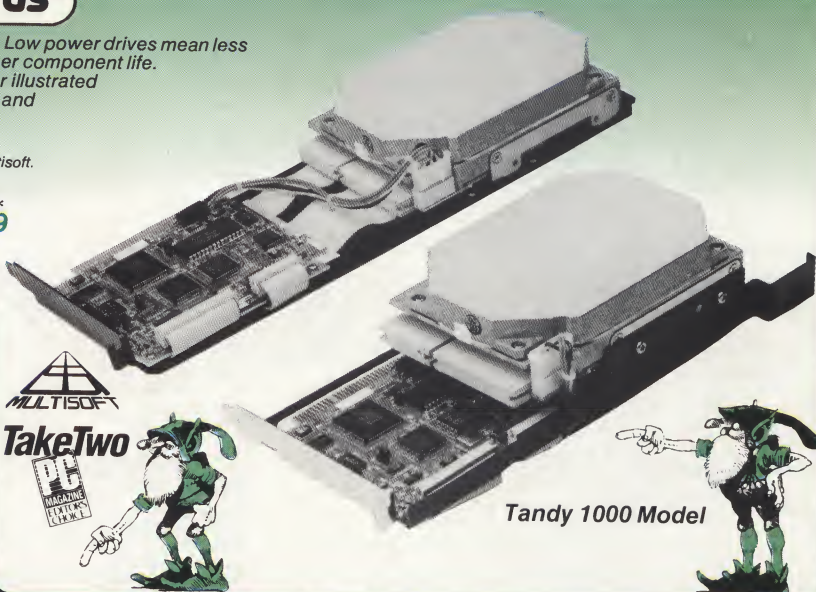
## Leprecard Hard Disk Cards

Leprecards feature components utilizing the latest technology. Low power drives mean less strain on your systems, lower operating temperature, and longer component life. You get a 1 year warranty, unlimited technical support, and our illustrated installation and user's guide. Models available for IBM PC/XT and compatibles, as well as TANDY 1000/AI/SX/TX/TL/SL.

**FREE SOFTWARE** Including TakeTwo, the backup utility PC MAGAZINE named Editors Choice in 1986 & 1987, and PC-KWIK disk caching from Multisoft.

21MB 48ms <b>\$299</b>	32MB 48ms <b>\$339</b>	40MB 70ms* <b>\$449</b>	49MB 28ms* <b>\$549</b>	65MB 16ms* <b>\$649</b>
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\* Average access speed per partition  
Tandy 1000/AI/SX/TX/TL/SL Leprecards add \$20

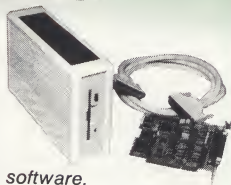


## 3.5" Floppy Kits

Internal kits for PC/XT/AT computers include 5 1/4" mounting brackets, black & gray face plates, and AT rails. 1.44MB for PC/XT includes high speed Western Digital controller.

**FREE TAKE TWO** floppy backup software.

720 Kit <b>\$109</b>	1.44MB for AT <b>\$139</b>	1.44MB for PC/XT <b>\$199</b>
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## PC/XT Disk Kits

- Pretested & formatted
- Western Digital short slot controller
- 30 page installation guide & reference manual
- Cables, mounting screws, full & half-height face plates
- 1 year Warranty, 30 Day Money Back Guarantee
- Optional: 150 watt, UL/FCC approved power supply for IBM PC's \$69

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Half-Height/14.8 watts

### 30MB KIT \$299

• Seagate ST238 - 32.7MB/65ms.  
Half-Height/14.8 watts

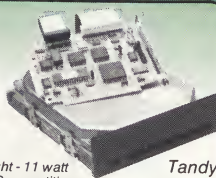
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• pre formatted into a pair of 21MB/28ms partitions.

### 65MB KIT \$549

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Tandy  
1000 kits  
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"One of the Laserjet's strongest competitors"  
INFOWORLD October 5, 1987

512K <b>\$1495</b>	1.5MB <b>\$1595</b>
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Toner Cartridge \$29

## AT Hard Disk Kits

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HH	Seagate ST251	40ms	42MB	<b>\$359</b>
HH	Seagate ST251-1	30ms	42MB	<b>\$449</b>
HH	Toshiba Drive MK134	25ms	44MB	<b>\$499</b>
FH	Seagate ST4096	28ms	80MB	<b>\$599</b>
FH	Maxtor 1140	27ms	117MB	<b>\$1669</b>
FH	Maxtor 2190	30ms	150MB	<b>\$1999</b>

## LepreFAX Modems

- Easy to use POP-up Menus
- Sends ASCII or word processing files
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- Sends/Receives from any Group 3 fax machine
- Automated sending during low phone rate periods
- Portable external plugs into PC/XT/AT serial port, **\$359**

4" Hand Scanner with HALO DPE software **\$269**

External  
**\$359**

Internal  
**\$289**



## 2400 Modems

with MNP

External Internal  
**\$239 \$229**

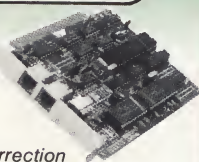
Hayes Compatible,  
300/1200/2400

MNP Level 4 error correction

**FREE MIRROR II** Software, a \$69 value

Internal model **\$229**, fits in a short slot

2400 without MNP **\$159** Ext **\$109** Int



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Designer VGA 512K	<b>\$299</b>
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**\$895**

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80286 processor running at 6/10 Mhz with 0 wait states provides a Norton SI rating of 11.5. 8 slots - Room for 1 full and 3 half-height drives-220 watt power supply - clock/calendar - Choice of 1, 2 or 1.44MB floppy drive-Genuine Western Digital combination Hard disk/floppy controller-American made Maxiswitch 84 or 101 key keyboard - 512K RAM standard expandable to 1MB Award BIOS- 1 year warranty - 30 day money back guarantee.

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EGA Card & EGA Monitor	<b>\$1495</b>	NEC Multisync II Monitor	<b>\$1895</b>



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**FAST**



**Includes:** 8086 Processor at 10 MHz with 0 Wait States, Princeton MAX-12 Amber Monitor, Video Card, 640K RAM, 360K Floppy, 20MB Hard Disc, Word Processing Software with Data Merge and Spell Check, 101 Key Keyboard, MS-DOS 3.2, Panasonic KX-P1091M2 Dot Matrix Printer, Printer Cable, 10 Floppy Discs, Free Delivery (see terms)

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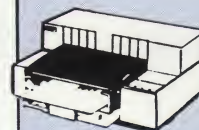
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**OR**

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AT&T Mono Mon. & EGA Card	+ \$300
AT&T EGA Monitor & Card	+ \$750
Omnicon Mono Card	+ \$65
Paradise EGA Card	+ \$165
Leading Edge Mono Monitor	+ \$50
Princeton or Amdek Monitor	+ \$150
Magnavox EGA Color Monitor	+ \$370
20MB Hard Disc	+ \$285
30MB Hard Disc	+ \$325
MS-DOS 3.2	+ \$70
1200B/2400B Modem	+ \$75/149

Your Total Delivered Price \$ \_\_\_\_\_

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**Features:** 300dpi graphics, 240cps draft, 120cps LQ, Parallel, Serial

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Fonts A,E,F,H,J . \$59.00 Fonts B,C,D,G,M \$75.00  
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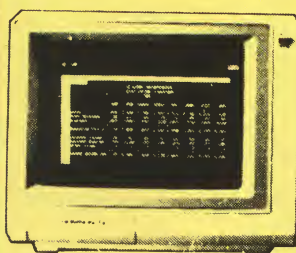
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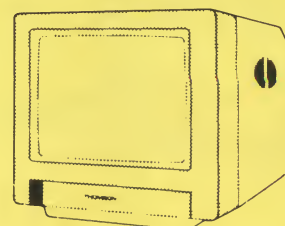
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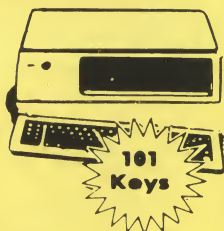
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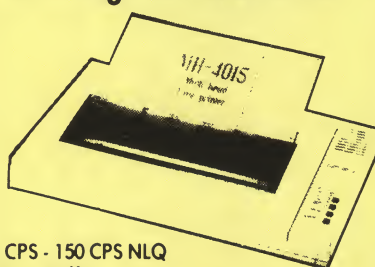
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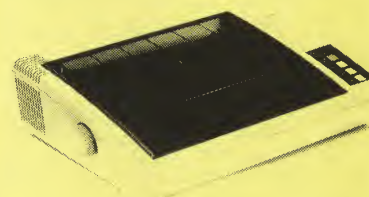


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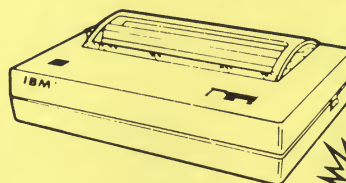
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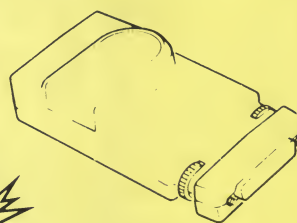


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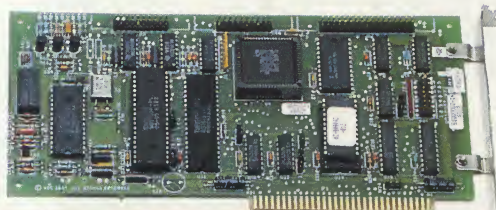
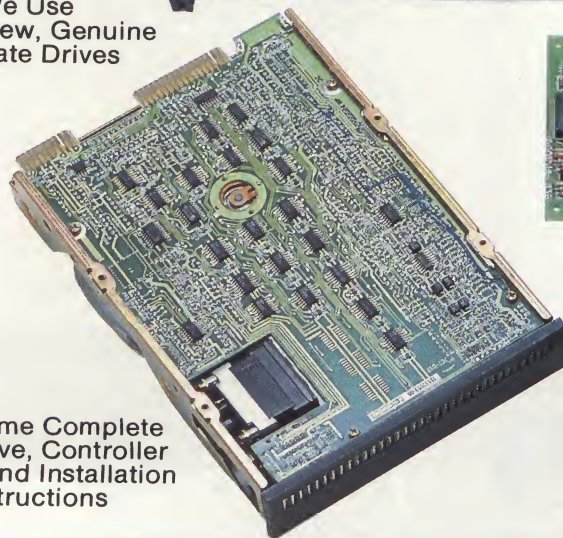
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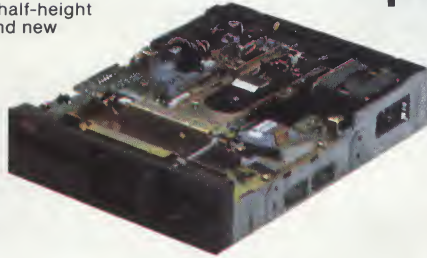
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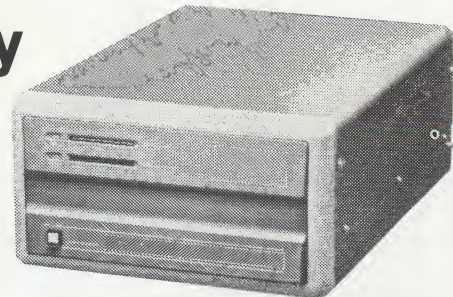
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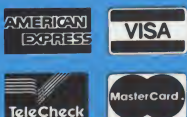
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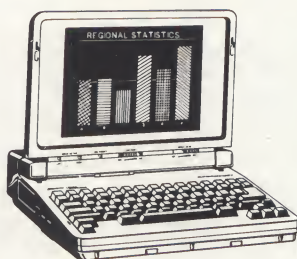


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## UTILITIES

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## PROGRAMMING

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**EBL & OPAL (1407)** Two fantastic batch language processors. Super-charge your batch files.  
**SWISS ARMY KNIFE (1412)** Dramatically improves BASIC program performance.  
**ADVBAS (1413)** The best Basic programming aid. Advanced function library, windows, etc.

## GRAPHICS

**GRASP (1605)** Create and run fabulous graphic demo programs. Any graphics card.  
**PC-KEY DRAW (1608-1609)** (2 disks) Powerful drawing/CAD program with clip art. Requires CGA.  
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## RELIGION

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**PROCOMM PLUS (1702-1703)** (2 disks) Newest. All features, menu-driven. Top rated.  
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## EDUCATION

- ☐ **Polyglot**—Provides a learning environment for basic to advanced vocabulary for many topics/languages
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## DATABASE

- ☒ **File Express (a, b)**—Menu-driven DBase (2 disks)
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## TOP 40

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### WORD PROCESSING/DATABASE

- ☒ **PC-Write (a, b)**—A very popular, complete, and easy to use word processing package (a, b)
- ☐ **Letter Writer**—Makes letter writing. Includes complete mail merge functions
- ☐ **New York Word**—Includes mail-merge, split screens, macros, spell-checking, and more
- ☐ **PBase**—Relational DBase with query language
- ☐ **MailMaster**—Full-featured mail list manager
- ☒ **PC-File+ (a, b, c)**—The most powerful and complete DBase we have found. Has the features of the top commercial products (3 disks)

### EDUCATION

- ☐ **Facts**—Teaches kids the states, presidents, capitals, etc. \*(CGA)\*
- ☐ **Typing Tutor**—It's easy to improve your typing skills with this handy tutor
- ☐ **Computer Tutor**—This interactive tutor makes learning DOS and other computer topics much easier for the new user
- ☐ **Geography**—Make learning fun for kids or adults with this geography trivia game
- ☐ **Bible Quiz Plus**—A bible trivia game that 1-6 can play. Use the large base of questions/answers or add your own
- ☐ **Spanish I**—Beginning Spanish for the student
- ☐ **Math Tutor**—A fun way for kids 5-12 to improve their math skills
- ☒ **Lotus Learning System (a, b)**—Makes it easy to master Lotus 1-2-3. Lotus 1-2-3 or PC-Calc+ are recommended (2 disks)

### UTILITIES/APPLICATIONS

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- ☐ **Sidewriter**—Prints spreadsheets and text files sideways. Works best with IBM or Epson compatible printer
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- ☐ **Banner Maker**—Make banners easily with this one
- ☐ **Piano Man**—Record, edit, and play back your favorite tunes. Also can turn your keyboard into a piano

### GAMES

- ☐ **Striker**—Helicopter attack game. Risk is included on the disk \*(CGA)\*
- ☐ **Great Games**—A Pac-Man clone, a Ms. Pac-Man clone, a paratrooper game, and more \*(CGA)\*
- ☐ **Q-Bert**—Play the arcade hit at home. Other games included \*(CGA)\*
- ☐ **Backgammon**—Play against the computer. Centipede also included \*(CGA)\*
- ☐ **Monopoly**—Great color and sound \*(CGA)\*
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- ☐ **Global ThermoNuclear War**—Inspired by the movie "Wargames"

## DATABASE (cont.)

- ☒ **Recipes (a, b)**—A complete recipe DBase that collects all your favorite and comes with many new favorites (2 disks)

## UTILITIES

- ☐ **Desk Mates**—A whole collection of Sidekick-like utilities
- ☐ **Best Utilities**—Includes a flexible RAM disk, print spooler, file locator, a selective delete command, and more
- ☐ **AutoMenu**—Personal menu that lets you run all your programs with a keystroke from an auto-booting menu
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## APPLICATIONS

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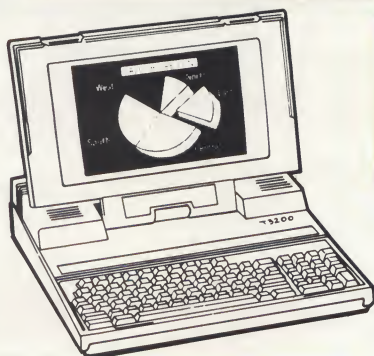
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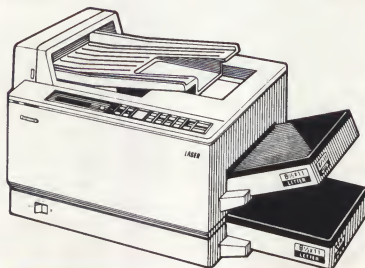
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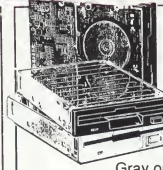
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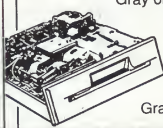
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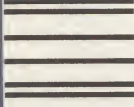
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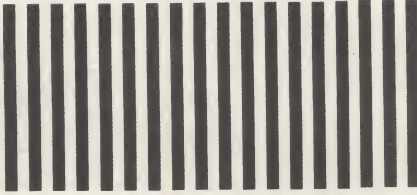
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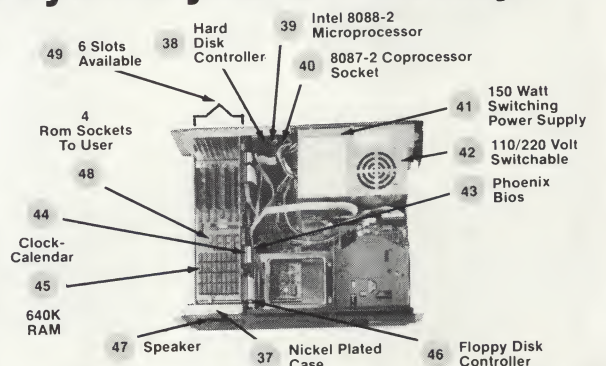
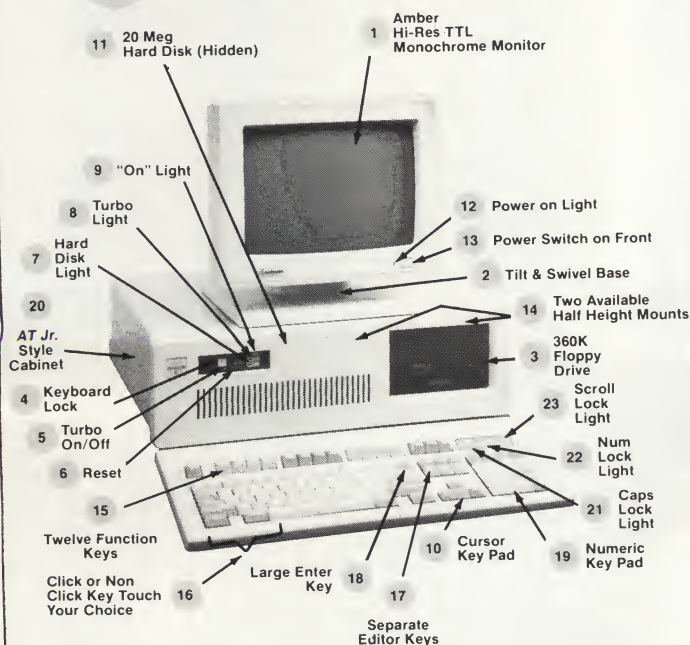


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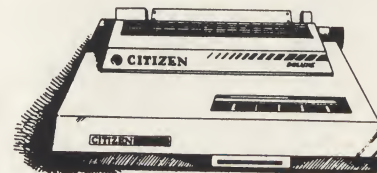
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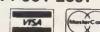
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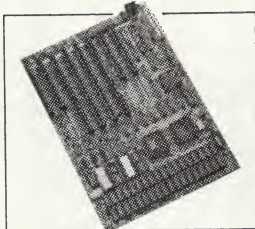
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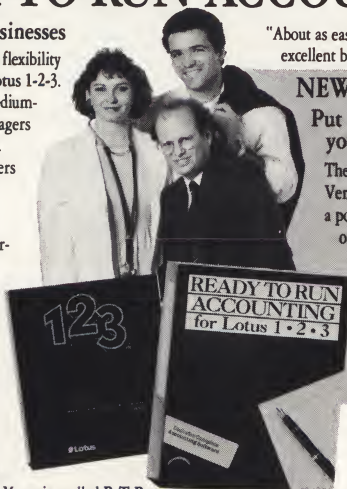
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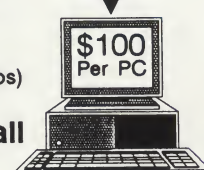
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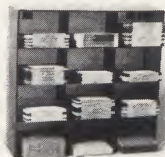
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**5** Do you plan to buy any of the hardware or software mentioned below in the next 12 months (check all that apply):

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t ☐ Add-in Board  
u ☐ Communications

#### Software

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w ☐ Spreadsheet/Financial Planner  
x ☐ Project Managers  
y ☐ Word Processors  
z ☐ Database Managers  
1 ☐ Graphics  
2 ☐ CAD/CAM  
3 ☐ Communications

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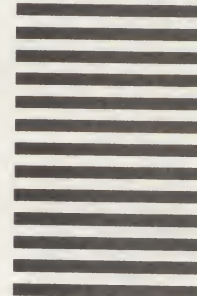
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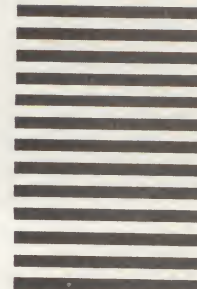
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## 3-D

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10:29AM May 26, 1989  
F1 for help or F10 for menu

Aggregate expenses for all departments for July 1989:

Advertising	\$321,529.00
Administrative	\$236,382.00
Operations	\$307,645.00
Manufacturing	\$632,591.00
Research and development	\$158,044.00
Total expenses	\$1,656,191.00

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ADVER.LCD.D13  
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Advertising

Magazines	July 1989
Newspapers	152,394.00
TV & Radio	89,999.00
Skywriting	23,876.00
Total	45,260.00
	321,529.00

24-C:\BUDGET\ADVER.LCD

BUDGET.LCD.D13  
10:29AM May 26, 1989  
F1 for help or F10 for menu

Inc Magazine	68,124.00
Business Week	14,400.00
Money Magazine	13,850.00
Economist	13,850.00
Harper's	13,850.00
Forbes	13,850.00
Total	152,394.00

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EXPENSE.LCD.D13  
10:29AM May 26, 1989  
F1 for help or F10 for menu

Expenses

Magazines	152,394.00
Newspapers	89,999.00
TV & Radio	23,876.00
Skywriting	45,260.00
Total	321,529.00

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# Any cell can contain a complete other spreadsheet that you can access with a single key.

*Fig. 1 Let's get the detail on those ad costs. Press one key, the Grey + key.*

07:05pm Jul 26, 1989 FI for help or F10 for menu

Aggregate expenses for all departments for July 1989:

Advertising	\$473,923.00
Administrative	\$236,382.00
Operations	\$307,645.00
Manufacturing	\$632,591.00
Research and development	\$158,844.00
Total expenses	\$1,808,585.00

14-C:\BUDGET\EXPENSE.LCD

07:05pm Jul 26, 1989 FI for help or F10 for menu

Advertising July 1989

Magazines	152,394.00
Newspapers	99,999.00
TV & Radio	123,876.00
Skywriting	97,654.00
Total	473,923.00

24-C:\Budget\Adver.Lcd

*Fig2. Want to see the detail on Newspapers? Just move to that number and press Grey +.*

15:05pm Jul 26, 1989 FI for help or F10 for menu

Newspapers July 1989

Washington Post	21,966.00
Dallas Morning News	14,886.00
New York Times	24,567.00
Chicago Tribune	17,654.00
Miami Herald	9,876.00
Los Angeles Times	11,050.00
	99,999.00

34-C:\Budget\News.Lcd

## What Makes Lucid® 3-D So Special

In the screen examples you can see Lucid® is really three dimensional. Any cell of the spreadsheet can contain a complete other spreadsheet that you can access with a single keystroke. It is as simple as the pictures show. And you don't have to write formulas to do that.

All you do is go look at the other file, navigating through easy, point and shoot directories. When you come back up (with one key) the link is made automatically for you.

Everything about Lucid® works that way. Users say "It is so intuitive that I really don't need a manual." That's because we use something we call a visual command menu. Jim Seymour, the noted PC columnist, talking about Lucid® in a recent article said that, "If there ever was an interface idea so good it ought to be stolen and widely used, this is it."

What he was talking about is a new menu approach that follows a simple design concept: it is easier to recognize than it is to remember. As choices are made on a menu that take you to lower levels you always can see exactly where you came from and where you are going. The complete menu path is always visible. You cannot get lost several levels down. This means you never have to remember a command, you just flow right to it.

Plus, no matter where you are on a menu or what you are doing, just press function key F1, and you will get a help screen specific to that command or action. Or if you want to know about any subject you can pop up an index of over 600 topics and select the one you want.

## Notepad Behind Every Cell

Another 3-D feature is that any cell can also contain a multiple page note that you instantly access with a single keystroke. You can write notes, memos or letters that relate to your work, save them as individual files and even print them separately or with your spreadsheet.

*Fig.3 Here we are on level 3. There's no limit to the levels you can move down!*

screen are completed. Other calculations you don't see continue on in the background during the next commands. The end result of this powerful combination is you rarely wait for a recalculation with Lucid®. You find out what instantaneous is all about.

**"I've been calling it an 'Everyman's Spreadsheet', and I think that's how the market will position it. It's much more than an inexpensive alternative to 1-2-3."**

**Jim Seymour, Columnist, PC Magazine, PC Week**

## Speed

Lucid® 3-D™ is truly revolutionary. It is fast, fast, fast! It is incredibly quick in performing calculations because it doesn't recalculate every cell every time you insert an entry. Instead, it only recalculates the specific cells that are affected by your change. This is called minimal recalc. Lucid® also has a remarkable innovation called background recalc in which you are given control of the cursor the moment calculations affecting your viewing

## Lucid® Learns

Lucid® 3-D™ also lets you teach it in any combinations of keystrokes so that involved sequences can be done with single keys. Plus more than just remembering keystrokes, Lucid® allows you to create Macros with loops, procedures and conditional branching amazingly all done automatically with simple menus. You can create your own menus that show the new features you have taught it. Another great feature is you can make your custom menus work like Lucid®



# Return it within 60 days if you're not ecstatic!

# ONLY \$99

6:06pm Jul 26, 1989 FI for help or F10 for menu

Unit cost per 100 lbs	May	June
Product purchases	1.10	1.10
Teen magazine	4,770.00	4,770.00
Seventeen	2,007.00	2,007.00
Glamour	1,500.00	1,500.00
Healthy You	2,345.00	2,345.00
Shrink wrapped	3.40	3.40
Cream foundation	175.00	175.00
Facial scrub	14.80	14.80
Facial toner	300.00	300.00
Body cream	88.00	88.00
Show kits	8.10	8.10
Counter displays	45.60	45.60
PRODUCT.LCD	91.00	91.00
BUDGET\LOTION.LCD	8,192.00	9,017.00
MFG\RENT.LCD		

*Look! Lucid does multiple windows. Notice: different drives, directories, down many 3-D levels. All at the same time!*

Memo to: Robert Smith

Enclosed are my estimates for the June 1988 Budget. Please take a look at them, and see if they agree with your expenditures.

Expense Budget June 1988	
Advertising	478,305
Administration	234,567
Operations	265,432
Manufacturing	174,002
Research	842,681
<b>Total</b>	<b>1,994,987</b>

Get back to me as soon as possible.

Thanks,  
James Johnson

C:\BUDGET\JOHNSON.WP Doc 1 Pg 1 Ln 1 Pos 5

*Here, we popped Lucid up over Word Perfect. Then we pumped those figures into a letter on-the-fly with the Clipboard. Click, click—that quick!*

where one choice can take you down a level to a whole new set of choices. What's nice is that they will work from one spreadsheet to another.

## Mouseability

Lucid® 3-D™ was designed for both keyboard enthusiasts and mouse lovers alike. You can take your pick. Designed around the mouse from the ground up, the interface is smooth and natural. You select files to load from directory lists. Everything is point and click. What's more, any Lucid® 3-D™ menu selection can be "moused" and the response time is "right now" instead of the sluggish "a little bit behind you" feel of add-on mouse menu systems like those you've seen with 1-2-3.

A window pops up with a library of function names you can page through with the mouse. Select, click and it's in the formula with no typing required. You even have a label window that you can fill (from the keyboard) with favorite labels and names so that you can insert them later with the mouse. There's even a pop-up calculator to insert numbers so you don't have to go to the keyboard very often.

It really permits that feeling of becoming one with your work. Lucid 3-D™ has windows of user defined range names as well as the macros named by the user that can be selected just by

pointing and clicking. Icons that are easy to grab with the mouse let you resize and move the spreadsheet window with the ease you would expect. Plus you can go anywhere on the sheet by moving the mouse and clicking on the spreadsheet borders. And remember, Lucid® is designed so that any of those features are done with or without the mouse easily and quickly.

## Audit

When you are staking a big decision on information gained from a spreadsheet you need to be certain that you have made no mistakes. Lucid® 3-D™ offers five audit displays and printouts.

Even if you don't plan to abandon 1-2-3, Lucid® makes sense. Files are

converted between them with ease so there's not an interoffice compatibility problem. This means you can have the power and fun of Lucid® 3-D™ without having to upset your present systems.

We are excited about Lucid® 3-D™. But don't take our word for it, take us up on our 60 day offer.

Call us on our order line number and we will ship your order the very next day. This \$149 offer will end as soon as our dealer network is fully stocked. But in the mean time we invite you to try Lucid® as part of our "spread the news" campaign. Just pick up the phone and call us. We accept all major credit cards or you can order COD.

## Pop-up Spreadsheet

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"The Breakthru 286 performed flawlessly with every application we handed it, including copy-protected programs and nine memory-resident utilities at once."  
Stephen Manes, PC Magazine

"...the Breakthru 286 was the card of choice."  
PC BusinessSoftwareview (Rated #1)

"...Breakthru 286 is a good value and a quality product backed by effective support."

Dan A. Griffin  
The Newsletter of the AutoCAD User's Group

"The PCSG Breakthru 286 achieved the best performance results of the caching boards tested."

Ted Mirecki, PC Tech Journal (Rated #1)

"The 12-MHz Breakthru 286-12 speedup board is the fastest of those tested, but not the most expensive. On a dollar per-horsepower basis, it could be called the cheapest boost available for an XT."

Mark Welch, InfoWorld (Rated #1)

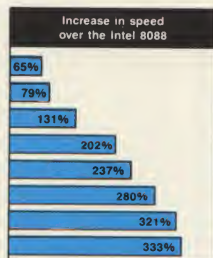
# Think You Need an AT?

Make Your IBM PC Faster Than an AT in Just 5 Minutes!

## Accelerator Cards: Speed and Value

Speed figures are consolidated results from 10 tests of CPU performance (See Accelerator Boards Special Report, December 1, 1986.)

<input type="checkbox"/> Microspeed Fast 88	\$149
<input type="checkbox"/> Microsoft Mach 10	\$395
<input type="checkbox"/> Univation Dream Board	\$512
<input type="checkbox"/> Orchid Turbo EGA	\$945
<input type="checkbox"/> ST&D Standard 286	\$995
<input type="checkbox"/> Classic Speedpack	\$995
<input type="checkbox"/> Orchid PC-Turbo 286e	\$1,195
<input type="checkbox"/> Breakthru 286-12	\$595



REPRINTED FROM INFO WORLD, APRIL 27, 1987

Breakthru 286-8MHz-\$395  
Breakthru 286-12MHz-\$595

LIGHTNING™—FREE with Breakthru  
speedup hardware—\$89.95 purchased separately

We are excited about our three speedup products. You probably know about our Lightning disk access speedup software that was awarded PC Magazine's Best of 1986 award (see box). After the smashing success of Lightning, in late '86, we

guaranteed the Breakthru 286 board to be literally the most advanced, fastest, most feature-rich board available. The runaway success it has enjoyed truly proved that assertion. Now we go ourselves one better with the Breakthru 286-12. This new board has the clock speed cranked up from 8 to 12 MHz for speeds up to 10.2 times faster than an IBM PC. It is 50% faster than an 8MHz IBM AT, and up to a whopping 1,000% faster than a regular PC.

### HERE'S WHY THESE TWO BOARDS ARE SO SPECIAL.

First, they install so easily. A half-slot card means you don't even have to give up a full slot. What's more, unlike competing

products it works in the Compaq Portable and most clones. Easy diagrams show how you just place the card in an open slot, remove the original processor and connect a single cable. There is no software required. From that moment you are running faster than an AT.

Second, they are advanced. The BREAKTHRU 286 replaces the CPU of the PC or XT with an 80286 microprocessor that is faster than the one found in the AT. Has a 80287 math coprocessor slot for numeric intensive applications. A 16K cache memory provides zero-wait-access to the most recently used code and data. Speed switching software allows you to drop back to a lower speed on the fly for timing sensitive applications.

Third, you have full compatibility. All existing system RAM, hardware, and peripheral cards can be used without software modification. Our boards operate with LAN and mainframe communication products and conform to the Expanded Memory Specification (EMS). Software compatibility is virtually universal.

Faster and smarter than an AT - PCSG guarantees it.

Fourth, these are the best. There are several other boards on the speedup market. We at PCSG have compared them all, but there simply is no comparison. Many cards offer only a marginal speedup in spite of their claims and others are just poorly engineered.

We are really excited about these products. PCSG makes the unabashed statement that the BREAKTHRU 286 card represents more advanced technology than boards by Orchid, Quadram, P.C.

Technologies, Phoenix...we could go on. Breakthru 286 is undisputedly the turbo board with the biggest bang for the buck. And we include FREE the \$89.95 acclaimed Lightning software. Call today with your credit card or COD instructions and we will ship your card the very next day.

But, no speedup board cuts disk access time in half

## LIGHTNING™

software can - \$89.95 or FREE w/Breakthru

"Lightning is almost mandatory...." -  
Steve Manes, PC Magazine  
Best of 86 review

Loads with the DOS - always ready as a background program to accelerate disk access. You do nothing - everything is automatic. Programs that frequently access the disk (hard or floppy) are made instantly up to 2 to 4 times faster. Uses a principle greatly enhanced from mainframe technology called caching. Fully exploits Above Board memory.

LIGHTNING is the standard against which all our competition measures itself because we achieve universal compatibility with other software. Data is never lost. Order LIGHTNING separately or get it free with your Breakthru 286 board.



# Think Again.

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